30 April 2023

DECLARATION OF DAVID J. MATTSON

Pertaining to Likely Effects of the South Plateau Landscape Area Treatment Project on Grizzly Bears

I, DAVID J. MATTSON, state as follows:

1. I am a scientist and retired wildlife management professional with extensive experience in grizzly bear research and conservation spanning four plus decades. My educational attainments include a B.S. in Forest Resource Management, an M.S. in Plant Ecology, and a Ph.D. in Wildlife Resource Management. My professional positions prior to retirement from the U.S. Geological Survey (USGS) in 2013 included: Research Wildlife Biologist, Leader of the Colorado Plateau Research Station, and Acting Center Director for the Southwest Biological Science Center, all with the USGS; Western Field Director of the Massachusetts Institute of Technology-USGS Science Impact Collaborative; Visiting Scholar at the Massachusetts Institute of Technology; and Lecturer and Visiting Senior Scientist at the Yale School of Forestry & Environmental Studies.

2. My credentials of direct relevance to this declaration arise from (1) having been a lead investigator of grizzly bear research in the Yellowstone Ecosystem during 1983-1993, preceded by involvement as a research technician during 1979-1982; (2) publications arising from this research during 1985-2011; (3) close involvement with development of the Yellowstone Grizzly Bear Cumulative Effects Model (CEM) during 1984-2004; and (4) being a resident of occupied grizzly bear habitat since 2010, as well as a close follower of published grizzly bear research during the last 43 years. I developed core elements of the CEM, reported in Weaver et al. (1986), Mattson et al. (1986), Mattson & Knight (1991), Mattson & Knight (1993), Mattson et al. (2004), and elsewhere, and drew the boundaries of current Bear Management Units (BMUs) and derivative Subunits in 1985 with the help of Drs. John Weaver and Donald Despain.

3. My declaration focuses on how the South Plateau Landscape Area Treatment Project (hereafter, SPLAT) may affect grizzly bears. In preparing this declaration I reviewed the following documents: *South Plateau Landscape Area Treatment Project: Final Environmental Assessment*, *Comment Consideration and Response: South Plateau Landscape Area Treatment Project*, *Draft Decision Notice and Finding of No Significant Impact: South Plateau Landscape Area Treatment Project*, *Literature Consideration and Response: South Plateau Landscape Area Treatment Project*, and *South Plateau Landscape Area Treatment Project: Wildlife Report*. Most of my declaration addresses material contained in the Wildlife Report given that this document informs and justifies content and conclusions pertaining to grizzly bears in all other SPLAT documents.

4. **The best available science shows that grizzly bears in the contiguous United States are not genetically or evolutionarily viable.**

4.1. According to the current scientific consensus, long-term population viability is best defined as conditions required to achieve roughly 99% probability of persistence for a period of approximately 40 generations (Reed et al. 2003, Frankham & Brook 2004, Reed & McCoy 2013). For grizzly bears, with average generation lengths of approximately 10 years, this time frame equates to around 400 years.

4.2. Given this definition, current research suggests that for a species such as the grizzly bear, with a low reproductive rate and a low ratio of effective to total population size, around 2,500-9,000 animals in a contiguous inter-breeding population are needed to attain long-term evolutionarily meaningful viability (Lande 1995; Reed et al. 2003; Cardillo et al. 2004, 2005; Frankham 2005; Brook et al. 2006; O'Grady et al. 2006; Traill et al. 2007; Frankham et al. 2014).

4.3. We are still far from reaching this benchmark for grizzly bears in the contiguous United States. Even the most optimistic estimates for total numbers of grizzly bears in the contiguous United States are in the range of 2,100 animals, but with these bears distributed among four isolated or partially isolated populations. Even the largest of these in the Northern Continental Divide and Greater Yellowstone Ecosystems number no more than about 1,000 bears (US Fish & Wildlife Service 2021).

4.4. Achieving meaningful viability for grizzly bears in the contiguous United States will thus require genetic and demographic connectivity among existing populations along with full colonization of the Bitterroot Recovery Area.

5. Managing for grizzly bear habitat security using a static 1998 baseline defined solely by distance from roads and developed areas within the Primary Conservation Area (PCA) is a bureaucratic artifact.

5.1. The US Forest Service analysis of how SPLAT will affect grizzly bear habitat security asserts that maintaining a 1998 baseline of Subunit-level security within PCA boundaries will ensure that project actions do not jeopardize Yellowstone's grizzly bears. This assertion rests, in turn, on the justification for adopting this baseline contained in Habitat-Based Recovery Criteria, promulgated as an Amendment to the Grizzly Bear Recovery Plan (US Fish & Wildlife Service 2007). This Amendment also provides details regarding how habitat security should be calculated in the Greater Yellowstone Ecosystem.

5.2. According to the Amendment, calculations of habitat security are based solely on the area within any given Subunit >500 m from a motorized access route or other notable human infrastructure, with the proviso that these habitat patches be >10 acres in size. This road- and infrastructure-based calculation of security is, moreover, considered to be near exclusive parameter of relevance to the so-called 1998 baseline, especially in determination of impacts from projects such as SPLAT.

5.3. The definition of habitat security contained in the Amendment does not account in any way for the juxtaposition of roads with high-quality foods or habitats; any emergent changes in the way high-quality habitats are distributed relative to roads as a function of larger-scale environmental change; levels of human activity on roads; or types of human activities on access features that may affect lethality of encounters between humans and bears (see Mattson et al. [1996] for a discussion of the role played by human lethality in grizzly bear conservation). Put another way, the US Fish & Wildlife Service codified an assumption in its Amendment that none of these factors affect grizzly bear behavior or survival.

5.4. Put succinctly, the justification for adoption of a 1998 baseline put forth in the Amendment is as follows (US Fish & Wildlife Service 2007): the Yellowstone grizzly bear population had been growing between 1988 and 1998 (Eberhardt & Knight 1996, Harris et al. 2006) within bounds of the PCA, meeting Recovery Criteria. Therefore, habitat conditions that existed during this 10-year period were

sufficient to ensure population stasis or growth in perpetuity. Moreover [tacitly], the only aspect of "habitat" relevant to explaining this increase in the grizzly bear population, germane to US Forest Service lands, was the extent of areas >500 m from a motorized access route or other notable human infrastructure within the PCA, provided that this area was >10 acres in size, *ipso facto*. This logic thus further codified the assumption that no other factor is or will be of significance to future grizzly bear population growth, at least on US Forest Service jurisdictions within the PCA.

5.5. This chain of causal logic and inference is summarized in Figure 1a and 1b.

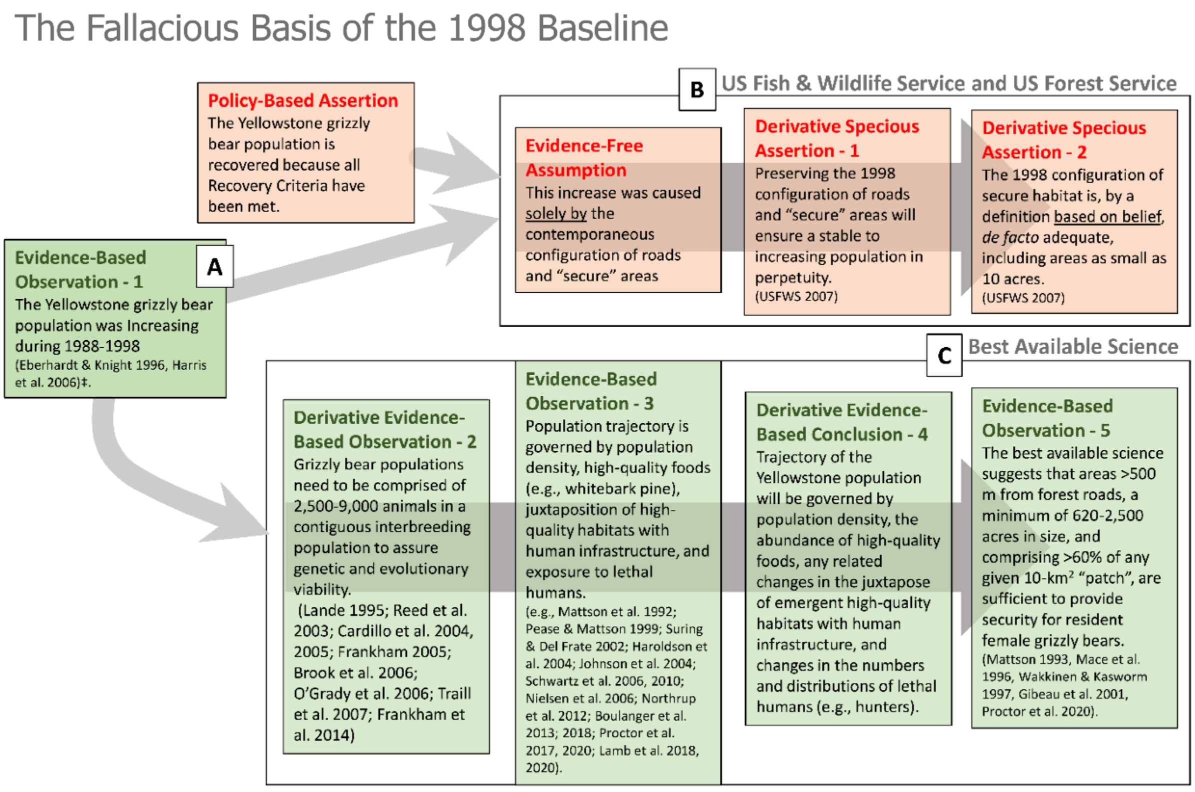

Figure 1. This graphic summarizes in (B) the specious and/or evidence-free basis for current reliance by the US Forest Service and US Fish & Wildlife Service on a 1998 baseline for managing grizzly bear habitat security in the Greater Yellowstone Ecosystem. Invocation of a 10-acre minimum size for "secure" grizzly bear habitat is a direct derivation of this problematic basis. An alternative science-based approach to managing grizzly bear habitat security is given in (C), accompanied by relevant scientific citations. Both chains of logic rest on a beginning assumption (A) that the Yellowstone grizzly bear population grew in size between 1988 and 1998. The implication of the chain of logic in (C) is that grizzly bear population growth is governed by population density, the abundance and distribution of high-quality native and anthropogenic foods, the distribution of those high-quality foods relative to humans and human infrastructure, and the numbers and distributions of lethal people, notably big game hunters. Management of habitat security ideally attends to the last three factors.

6. The logic used to support the 1998 baseline rests on a specious construction of cause and effect and is not supported by the best available science.

6.1. The causal logic deployed by the US Fish & Wildlife Service is: the security present during 1998 within the PCA boundaries, as defined by us, caused growth in the Yellowstone grizzly bear

population. Therefore, security as present during 1998 within the PCA boundaries will continue to cause growth of the population.

6.2. The problem with this logic is that it contravenes a compendious body of research and a more plausible causal chain, as summarized in Figure 1c, and attributes irrefutable cause and effect to coincidence of two phenomena in a moment in time (i.e., a configuration of roads and growth of a population), all while ignoring other well-supported drivers of grizzly bear population growth that had created a particularly auspicious environment for grizzly bears in the Yellowstone Ecosystem PCA between 1988 and 1998. More succinctly, synchrony in time is not the same as causation.

6.3. Leaving aside debate over the extent to which the Yellowstone population grew during this period (Mattson 1997a; Pease & Mattson 1999; Doak & Cutler 2014a, 2014b), any growth that did happen was driven by a combination of lower bear densities, abundance of high-quality natural foods, the removal of anthropogenic attractants near humans and human infrastructure, comparatively low levels of conflict catalyzed by livestock depredation and encounters with hunters – as well as by configurations of roads and other human infrastructure (Mattson et al. 1992; Gunther 1994; Gunther & Hoekstra 1998; Mattson 1998; Pease & Mattson 1999; Gunther et al. 2004; Johnson et al. 2004; Schwartz et al. 2006, 2010; Van Manen et al. 2016; Wells et al. 2019). High-quality foods were indeed abundant and heavily used by grizzly bears during this period (Mattson et al. 1991, 2004; Mattson & Reinhart 1994, 1995; Mattson 1997b, 2000).

6.4. All these factors affected not only the distribution of grizzly bears relative to human infrastructure in the Yellowstone Ecosystem PCA (e.g., secondary roads on US Forest Service jurisdictions), but also the comparative lethality of humans (see Mattson et al. 1996) and fecundity of female grizzly bears (Mattson 2000, Schwartz et al. 2006), with resulting predictable effects on growth of the grizzly bear population (Pease & Mattson 1999, Schwartz et al. 2006).

6.5. These results specific to the Yellowstone Ecosystem are amplified by research in other areas that highlight the important role played by the distribution of high-quality foods in driving distributions of grizzly bears relative to human infrastructure. The occurrence of attractive habitats and foods near human infrastructure (e.g., resource extraction and recreation roads) can, in fact, create population sinks that adversely affect the trajectory of grizzly bear populations (Mace & Waller 1998: Nielsen et al. 2004, 2005, 2010; Roever et al. 2008a, 2008b; Graham et al. 2010; Boulanger et al. 2013; Boulanger & Stenhouse 2014; Proctor et al. 2017; Lamb et al. 2018, 2020).

6.6. There is, moreover, ample research showing that responses of bears to people on roads are affected by levels of traffic, traffic noise, and amounts of visual screening (Mace et al. 1996; Gibeau et al. 2002; Chruszoz et al. 2003; Martin et al. 2010; Ordiz et al. 2014, 2016; Roever et al. 2010; Northrup et al. 2012; Ladle et al. 2019; Parsons et al. 2020, 2021).

6.7. Attributing population growth largely, if not solely, to the extent and distribution of roads on public lands within the PCA is not scientifically defensible; nor is the blithe assumption that all roads and so-called security areas are equal, as does, *de facto*, the 1998 baseline. Given all the available evidence, one could just as defensibly conclude that the Yellowstone grizzly bear population grew *despite* the 1998 configuration of roads and security on Forest Service lands in the PCA as opposed to growing *because of* this configuration.

7. Numerous changes have occurred in the Yellowstone Ecosystem PCA that have affected the comparative productivity of different grizzly bear habitats, the distributions of bears relative to people, and the numbers and types of people interacting with grizzly bears – all with potential adverse effects on Yellowstone grizzly bears.

7.1. Numerous natural and human-related changes have occurred in the environment of Yellowstone's grizzly bears since 1998, with demonstrable effects on grizzly bear diets, distributions, and habitats. These dynamics, in turn, have implications for not only the adequacy of current levels of presumed habitat security in and near the SPLAT project area, but also for the effects of planned roads and vegetation treatments on individual grizzly bears and the Yellowstone grizzly bear population.

7.2. For one, climate change is already evident, manifest in ever-warmer and droughty summers, as shown in Figure 2. Drought predictably affects soil moisture and vegetation productivity, whereas increased summer heat predictably affects the extent to which bears need forest cover to thermoregulate during the day.

7.3. There is compelling evidence that bear behaviors during hot weather are governed by the need to thermoregulate, including by selecting cooler wetter sites for foraging (Pigeon et al. 2016, Rogers et al. 2021) and by bathing in standing water (Sawaya et al. 2017, Rogers et al. 2021). There is, moreover, ample research showing that grizzly bears consistently select heavily-forested areas for daytime bedding (Blanchard 1983, Cristescu et al. 2013), with likelihood of bedding increasing when a bear is foraging on concentrated food sources (Mattson 1997c, 2000). In stands dominated by lodgepole pine, bedding is especially common when overstory basal area exceeds 20 m^2/ha (Mattson 2000).

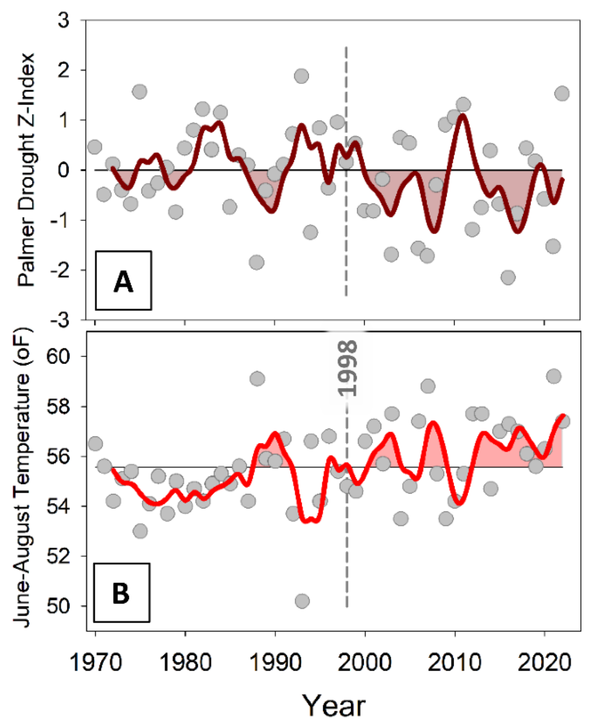

Figure 2. These trend graphs show (A) Palmer Drought Severity Z Index and (B) average summer temperature for the Yellowstone Basin during 1970-2022 (From NOAA National Centers for Environmental Information). Annual values are shown as gray dots and 3-year moving averages as a burgundy or red line. Summer temperatures are for June-August; the Z-index is for an averaged 5-month period culminating in August. Periods of multi-annual summer drought are show by light burgundy shading. Multi-annual periods of summer temperatures greater than the 1970-2022 average are shown by light red shading. The benchmark year of 1998 is also shown.

7.4. One can infer from this that, in an ever-warmer and drier world, grizzly bears will need more rather than less thermal and hiding cover, especially in areas impacted by human disturbance (Ordiz et al. 2011, Skuban et al. 2018).

7.5. Amounts and distributions of known high-quality bear foods have changed dramatically since 1998 in the

Yellowstone Ecosystem PCA, including in the Madison and Henry's Lake Bear Management Units (BMUs). Most notably, the central Yellowstone bison herd – which ranges out onto the Hebgen Lake flats near the SPLAT project area (Geremia 2020) – declined by nearly 60%, with most of this decline happening after 2005 (Figure 3a). At approximately the same time, most mature whitebark pine died during an outbreak of mountain pine beetles driven by hot dry weather between 2000 and 2009 (Figure 4 and citations therein). Losses were most dramatic in western portions of the ecosystem, including BMUs containing the SPLAT project area.

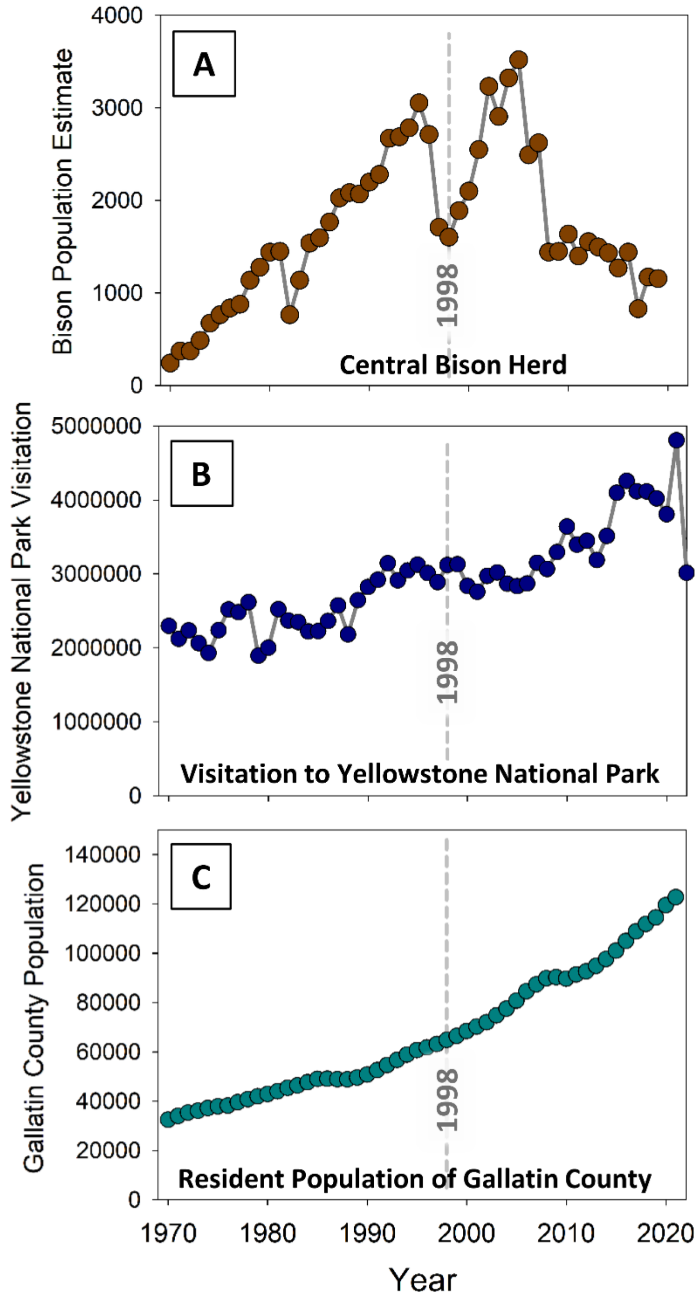

Figure 3. These trend graphs show (A) estimated size of Yellowstone's Central bison herd (Geremia et al. 2019, 2020), (B) documented annual visitation to Yellowstone National Park (https://irma.nps.gov/Stats/), and (C) estimated number of residents in Gallatin County, Montana (U.S. Census Bureau, https://data.census.gov/). The Central bison herd uses much of the Hebgen Basin, including areas immediately north of SPLAT (Geremia et al. 2020). All of the post-1998 trends shown here are adverse for grizzly bears, including a dramatic decline in an important food source (bison; Green et al. 1997, Mattson 1997b) and substantial increases in numbers of resident and visiting recreationists who predictably use Forest Service roads and trails. The latter trend heightens the odds that grizzly bears near access routes will encounter a human.

7.6. Bison are, per capita, one of the most important sources of food for Yellowstone grizzly bears, especially in northwestern portions of the ecosystem (Green et al. 1997, Mattson 1997b), inclusive of BMUs containing the SPLAT project area. Despite claims made in the SPLAT Wildlife Report, whitebark pine seeds were also an important high-quality food for grizzly bears in this same quadrant of the ecosystem (Figure 4; Knight et al. 1984, Mattson 2000, Mattson et al. 2004), especially in mountainous areas immediately north of the Hebgen Lake basin (Blanchard 1978, Podruzny 2012).

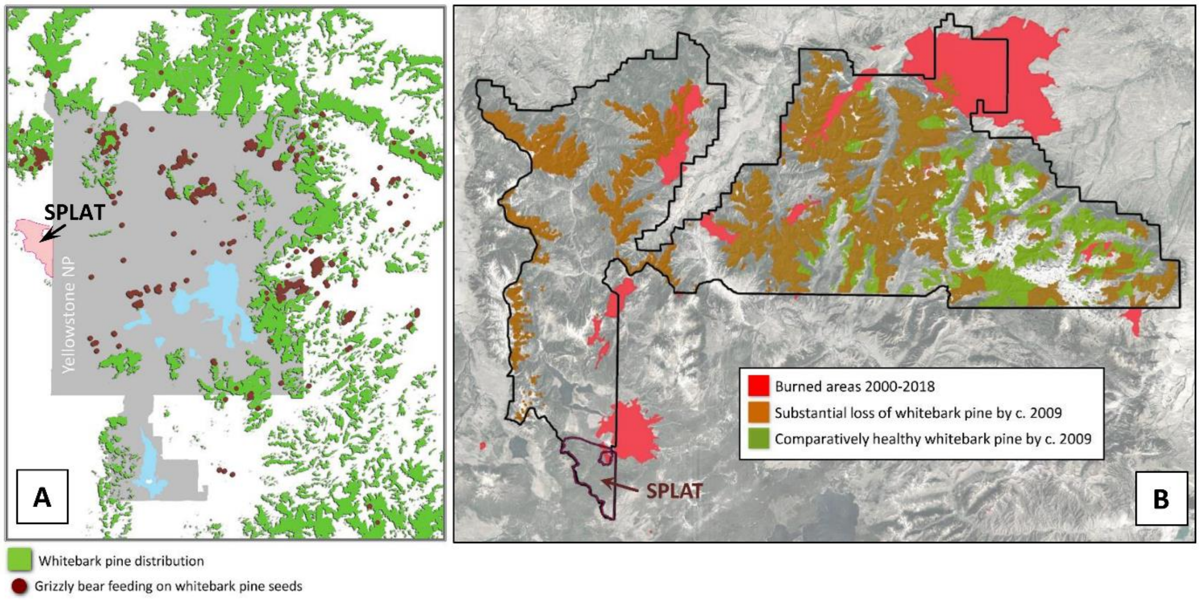

Figure 4. These maps highlight the location of the SPLAT project relative to (A) documented locations where grizzly bear fed on whitebark pine seeds, 1977-1996 (unpublished data used for analyses in Mattson [2000]), and (B) the extent of whitebark pine mortality since 2009 primarily due to outbreaks of mountain pine beetle. Areas burned by wildfires, 2000-2018, are also shown in (B). Substantial if not total losses of mature whitebark pine trees as of 2009 are shown in brown, in contrast to where levels of mortality had been comparatively light (in green; from Macfarlane et al. 2013 overlain on map entitled "Distribution of Whitebark Pine" in the CGNFPlan prepared by mfgonzales on 10/3/2019). The map in (A) offers a more accurate depiction of historical whitebark pine distribution compared to the map in (B), while further emphasizing that seeds from mature whitebark pine were utilized – sometimes extensively – even in areas where whitebark pine was not shown as "being present" in either map. Losses of whitebark pine together with the extent of recent burns have implications for compensatory foraging patterns of grizzly bears in nearby areas, including the SPLAT project.

7.7. There is compelling evidence that Yellowstone's grizzly bears have compensated for these losses by consuming more meat from elk and livestock as well as bison in northern portions of the ecosystem where the bison herd has grown dramatically (Middleton et al. 2013, Schwartz et al. 2014, Costello et al. 2016, Ebinger et al. 2016, Wells et al. 2019).

7.8. These changes in availability of high-quality foods and resulting reconfigurations of bear diets have caused predictable shifts in comparative productivity of different vegetation types (Mattson et al. 2004) as well as patterns of habitat use among grizzly bears within BMUs and BMU Subunits (Costello et al. 2014).

7.9. This dynamic situation involving grizzly bear foods, diets, and habitat use that unfolded since 1998 has undoubtedly affected the distribution of bears vis-à-vis the fixed infrastructure of roads

and so-called security areas in the Madison and Henry's Lake BMUs, which further debars the assumption that managing solely for maintenance of a road-defined 1998 baseline within the PCA provides adequate security for the regional grizzly bears, especially when this baseline ignores any juxtaposition of roads with habitat.

7.10. Numbers of people visiting or residing in the region containing the SPLAT project area have increased dramatically since 1998 (Figures 3b and 3c), including an approximate 1,000,000 increase in visitors to Yellowstone National Park, many of whom arrive or depart via the West Entrance near SPLAT (https://irma.nps.gov/Stats/). During the same period, permanent residents of Gallatin County, Montana, have roughly doubled in number. Not surprisingly, levels of dispersed recreation increased on the Custer-Gallatin National Forest by a staggering 76% between 2008/2009 and 2013/2014, with 41% of surveyed people describing hiking/walking as their primary activity (Oswald 2017). Bicycling was second most popular at around 8% (Oswald 2017).

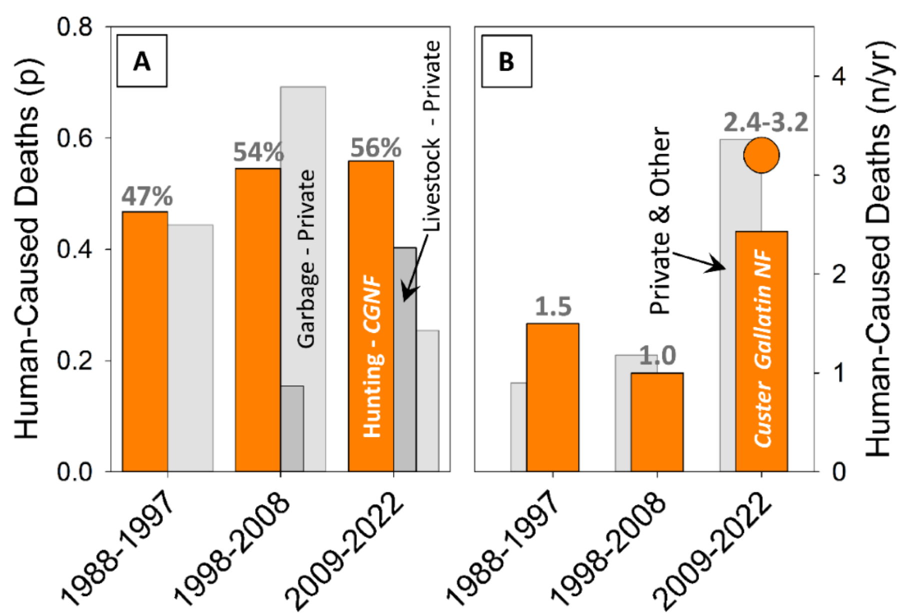

Figure 5. These bars graphs depict trends in (A) proportions of grizzly bears dying from dominant causes and (B) absolute numbers of grizzly bears dying per annum on the Custer Gallatin National Forest (CGNF or Custer Gallatin NF) and on adjacent private lands and state jurisdictions in Montana. Trends are broken down by three time periods: pre-1997, which predates the 1998 benchmark for habitat protections; 1998-2008, which corresponds with when whitebark pine was still relatively abundant; and post-2008, after which most losses have mature whitebark pine had occurred (Macfarlane et al. 2013, Van Manen et al. 2016). In (A), hunter-related deaths on the CGNF are shown in orange; deaths related to attractants near human residences on private lands (i.e., "Garbage") are shown in light gray; and deaths related to conflicts over livestock on private lands are shown in dark gray. The heights of bars in (B) are proportional to average numbers of grizzly bears killed by humans per year, with the average annual rate shown as a number. The orange dot for 2009-2022 allocates deaths "under investigation" to a human cause, whereas the associated bar doesn't.

7.11. Lethal encounters with big game hunters have been the dominant human cause of grizzly bear deaths on the Custer-Gallatin National Forest since 1988, but with the fraction of bear deaths attributable to this cause increasing from 47% during 1988-1997 to 54-56% during 1998-2022 (Figure

5a; data from U.S. Geological Survey, Interagency Grizzly Bear Study Team, Data and Tools; Knight et al. 1989-1993, 1997; Knight & Blanchard 1994, 1995; Haroldson et al. 1998; Schwartz & Haroldson 1999-2003; Schwartz et al. 2004-2010). Of perhaps greater consequence, numbers of grizzly bears annually dying from human causes on the Custer-Gallatin National Forest during 2008-2022 jumped by 2-3-fold compared to numbers annually dying during 1988-2008. Absolute numbers of hunter-caused bear deaths correspondingly increased as well.

7.12. The jump in human-caused deaths on the Custer-Gallatin National Forest followed catastrophic losses of whitebark pine during 2000-2009, decline of the central bison herd post-2005 (Figure 3a), and a sustained incidence of hot-dry summers (Figure 2) – all of which predictably affected patterns of habitat use by grizzly bears and resulting interactions with humans (e.g., Mattson et al. 1992, Mattson 1998, Haroldson & Gunther 2013). The increase in hunter-caused bear deaths is also plausibly linked to increasingly reliance of grizzly bears on a meat-rich diet since 2008 (see 7.11).

7.13. The dramatic increase in numbers of grizzly bear deaths on the Custer-Gallatin National Forest post-2008 cannot be adequately explained by increase in size of the grizzly bear population given that most of this increase occurred in the Demographic Monitoring Area outside the Primary Conservation Area, which contains all of the SPLAT project and much of the Custer-Gallatin National Forest (Van Manen et al. 2016). Moreover, any population increase that did occur post-2008 was small (Van Manen et al. 2023).

7.14. The jump in grizzly bear mortality since especially 2008 further calls into question any equivalence between a 1998-baseline of road-defined security confined to the PCA and fitness of Yellowstone grizzly bears.

7.15. Parenthetically, spatial scale is relevant to judging effects attributable to changes in grizzly bear foods, diets, and habitat use. In Yellowstone, this scale is theoretically captured by BMU and BMU Subunit boundaries (Weaver et al. 1986). Given that I was directly involved in developing the BMU concept and delineating the boundaries of BMUs and BMU Subunits (see 2, above), I can attest to the fact that Subunits were meant to capture seasonally important habitats within larger BMUs that were meant, in turn, to encompass all that individual bears might annually need. Contrary to implications of the SPLAT Wildlife Report, changes throughout the Madison, Plateau, and Henry's Lake BMUs potentially affect bears using the SPLAT project area.

8. Calculating habitat security for Bear Management Unit Subunits based on inclusion of patches as small as 10 acres is not based on the best available science.

8.1. The standards used in the Habitat-Based Recovery Criteria for identifying "secure" habitat result in defining patches as small as 10-acres adequate for ensuring the security of bears from people, and space to pursue life-sustaining activities (US Fish & Wildlife Service 2007). At root, this definition assumes, first, that 500-m buffers around roads and developments are sufficient to mitigate mortality risk and displacement and, second, that an area as small as 10 acres within a network of buffers is sufficient for grizzly bears to safely forage and rest for significant periods of time.

8.2. No research has shown that 10-acres accommodates the area used by most bears, most of the time, for periods even as short as a day. The few available studies of movements at this scale have, by contrast, shown grizzly bears to use areas 720-2,220 acres in size during 1-2-day periods (Mattson

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1993, Gibeau et al. 2001) – roughly 70-220 times larger than 10 acres. In other words, despite being defined as "secure" by the US Fish & Wildlife Service (2007) and the SPLAT Environmental Assessment, isolated areas much smaller than roughly 720-2,220 acres would require bears to spend significant periods of time <500 m from roads and developments to meet daily needs and thus defeat the standard's presumed purpose.

8.3. The logic of defining patches of secure habitat so as to encompass a typical 1-2-day forging bout has been affirmed in several authoritative documents. Guidelines published in 1994 for managing motorized access in grizzly bear habitat recommended that security areas be sufficient in size to encompass the area used by a female grizzly bear during a typical 24-hour period (Puchlerz & Servheen 1994). Historical Guidance for the Northern Continental Divide's Primary Conservation Area (also referred to as the Recovery Zone) similarly required that core security areas be >2,500 acres.

8.4. Perhaps most compelling of all, invoking Mattson (1993), the US Fish & Wildlife Service's 1994 *Biological Opinion on the Grizzly Bear Management Strategy for the Portion of the Plateau Bear Management Unit on the Targhee National Forest* (US Fish & Wildlife Service 1994) mandated that security areas within a "security zone" be >700 acres in size, buffered by 2-km on all sides, and that the resulting c. 7,000 acre patches be placed <1.8-km apart to facilitate safe passage by bears among secure area. The effectiveness of this prescription is evident not only in the fact that habitat security dramatically improved on the Plateau BMU, but also by unprecedented sustained occupancy of this area by reproducing grizzly bears (e.g., Van Manen et al. 2022).

8.5. In contrast to the empirical evidence and conceptual underpinnings that legitimize defining secure grizzly bear habitat as >500 m from a motorized access route and >700-2,500 acres in size, the only support offered for adopting a 10-acre threshold is "…The Service **believes** that all secure habitats are important and that secure pockets of habitat are very important for grizzly bears…" (US Fish & Wildlife Service 2007). There is no invocation of research or systematic analysis.

8.6. The 10-acre threshold for defining secure grizzly bear habitat is thus arbitrary and capricious, largely because it is faith-based rather than evidence-based and contravenes the best available science.

8.7. More concretely, as with the SPLAT Environmental Assessment and Wildlife Report, deployment of a 10-acre standard for defining core security predictably inflates estimates of true security. However, without access to the full spectrum of patch sizes in the SPLAT project area, the magnitude of this inflationary bias cannot be determined by an external analyst.

8.8. Even so, the SPLAT Wildlife Report does report the sizes of areas that the Forest Service claims will be added to the existing total of secure habitat at the end of the 15-year project: 16.4, 62.5, 441.5, and 604.9 acres. It is not clear to what extent these areas will consist of stand-alone patches or additions to larger secure areas. Nonetheless, all these patches would be <700 acres – three substantially less.

8.9. There is thus no legitimate basis for any US Forest Service claims or calculations regarding the amount of secure grizzly bear habitat in the SPLAT project area, much less any claims related to how the project will improve levels of security for grizzly bears.

9. Prioritizing for maintenance of deficient *status quo* habitat security on the Madison 2 and Henry's Lake 2 Subunits contravenes aspirational policy statements as well as the ESA mandate to recover threatened species.

9.1. Every reckoning of habitat security for grizzly bears in the Madison 2, Henry's Lake 2, and Gallatin 3 Subunits has shown levels to be inadequate, regardless of the deployed standards. This comports with several analyses showing these Subunits and, more specifically, the SPLAT project area to be among the most deficient in the Primary Conservation Area (Figure 6), to the extent of being sinks for the Yellowstone grizzly bear population (Figure 6a; Schwartz et al. 2010).

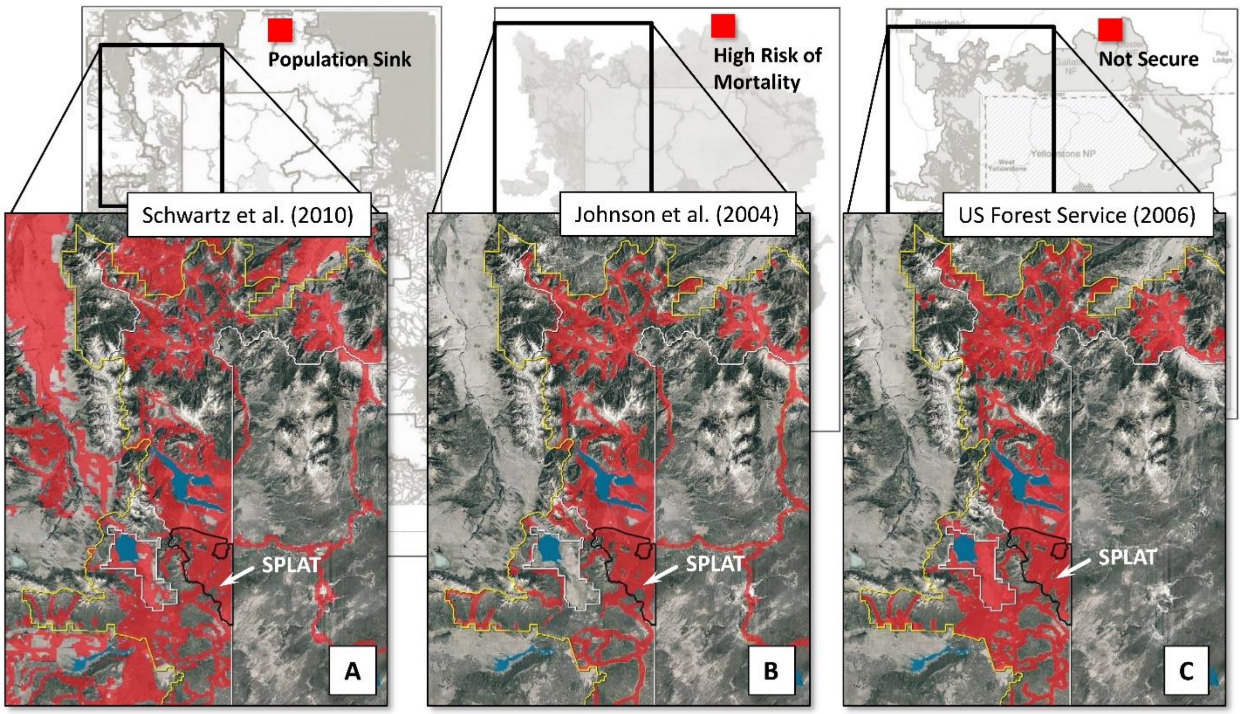

Figure 6. These maps show the SPLAT project area relative to three different reckonings of habitat security for grizzly bears. Map (A), adopted from Schwartz et al. (2010), shows areas, in red, where modeled annual survival of adult female grizzly bears is <0.91. This threshold is a surrogate for identifying areas that function as population sinks (i.e., bear deaths exceed bear births). Map (B), adopted from Johnson et al. (2004), shows areas, in red, with the highest modeled mortality risk for grizzly bears in the Greater Yellowstone Ecosystem. Map (C), adopted from the U.S. Forest Service (2006), shows areas that are not "secure" for grizzly bears (i.e., >500 m from a road and >10 acres in size). These three representations of habitat security are not only identical, but also make clear that the SPLAT project encompasses one of the least secure areas of US Forest Service jurisdiction within the Primary Conservation Area.

9.2. Aspirational statements in the USFWS 2007 Habitat-Based Recovery Criteria and Gallatin NF 2006 Travel Plan, as well as in the SPLAT Wildlife Report, acknowledge this deficit. The Forest Supervisor who signed off on the Travel Plan created a goal (G-1) that "essentially prioritizes future proposals for road/trail *closure and rehabilitation* to these three subunits," with the goal of increasing habitat security levels in the Henry's Lake 2 and Madison 2 Subunits from 52 and 67% to 63% and 72%, respectively. The Habitat-Based Recovery Criteria deferred to terms of the Travel Plan, but largely with reference to "…the *timing and amount of improvement*…" in security of these Subunits (US Fish & Wildlife Service 2007). Before this, the 1995 US Fish & Wildlife Service amended biological opinion on the Gallatin National Forest Plan admonished that any forest activities involving

changes to motorized access would "…be designed to *improve, or at a minimum, designed so as not to increase*…" existing road-related impacts (US Fish & Wildlife Service 1995).

9.3. Nonetheless, levels of ostensible habitat security have remained essentially unchanged in the Madison 2 and Henry's Lake 2 Subunits since 1995 (Van Manen et al. 2022; SPLAT EA and Wildlife Report). The only justifications offered for perpetuating this deficient condition are either that it would entail too many costs or trade-offs to remedy (US Forest Service 2006) or that a certain number of grizzly bears using these Subunits are expendable (i.e., subject to incidental take; US Fish & Wildlife Service 1995, 2007), largely because "…the grizzly bear population has been increasing…", as per the rationale described in 5, above. Population increase and fulfilment of Recovery Criteria within the PCA have been judged adequate by the US Fish & Wildlife Service to justify such take, despite having had two previous attempts to remove ESA protections for Yellowstone's grizzly bear population during 2007 and 2017 invalidated by Federal District and Appellate Courts on four occasions, most recently in 2020.

9.4. The proposed SPLAT project thus perpetuates conditions that demonstrably compromise, rather than contribute to, meaningful recovery of the Yellowstone grizzly bear population and long-term viability of grizzly bears in the contiguous United States (see 4, above); fails to prioritize significant rather than meaninglessly small increases in habitat security for grizzly bears within affected Subunits (see 8, above); disregards codified authoritative aspirations; and abandons duties under the ESA to recover threatened species.

10. The SPLAT project area occupies a portion of the Greater Yellowstone Ecosystem critical to connectivity with the Northern Continental Divide grizzly bear population and colonization of currently unoccupied portions of the Bitterroot Recovery Area.

10.1. The SPLAT project is in a portion of the Yellowstone PCA that has sourced numerous grizzly bears dispersing into and colonizing peripheral habitats (Figure 7a and 7c). Several of these dispersers have been documented in the High Divide area between Greater Yellowstone and the Bitterroot Recover Area. Importantly, continued colonization of these areas has the potential to establish connectivity between the Greater Yellowstone and Northern Continental Divide grizzly bear populations, as well as foster natural colonization of the Bitterroot RA, and, through this, achieve long-term genetic and evolutionary viability of grizzly bears in the contiguous United States (see 4, above).

10.2. The locations of grizzly bears confirmed to be dispersing into and colonizing peripheral habitats comports with the predictions of several researchers. Walker and Craighead (1997) modeled dispersal routes among ecosystems in the Northern Rockies, identifying a major connector between the Yellowstone ecosystem and central Idaho through the Centennial Mountains (Figure 7a). This connector originates near the SPLAT project area. Peck et al. (2017) also modeled potential dispersal routes, "collecting" bears from nearer the periphery of the ecosystem compared to Walker & Craighead, but nonetheless confirming that the northwest quadrant of the Yellowstone Ecosystem is key to connectivity.

10.3. Dispersing grizzly bears are also confirming the results of research that modeled the distribution of habitat potentially suitable for permanent occupancy by grizzly bears, shown as

shades of green in Figure 7a (Merrill et al. 1999; Carroll et al. 2001, 2003; Merrill & Mattson 2003; Craighead et al. 2005; Merrill 2005).

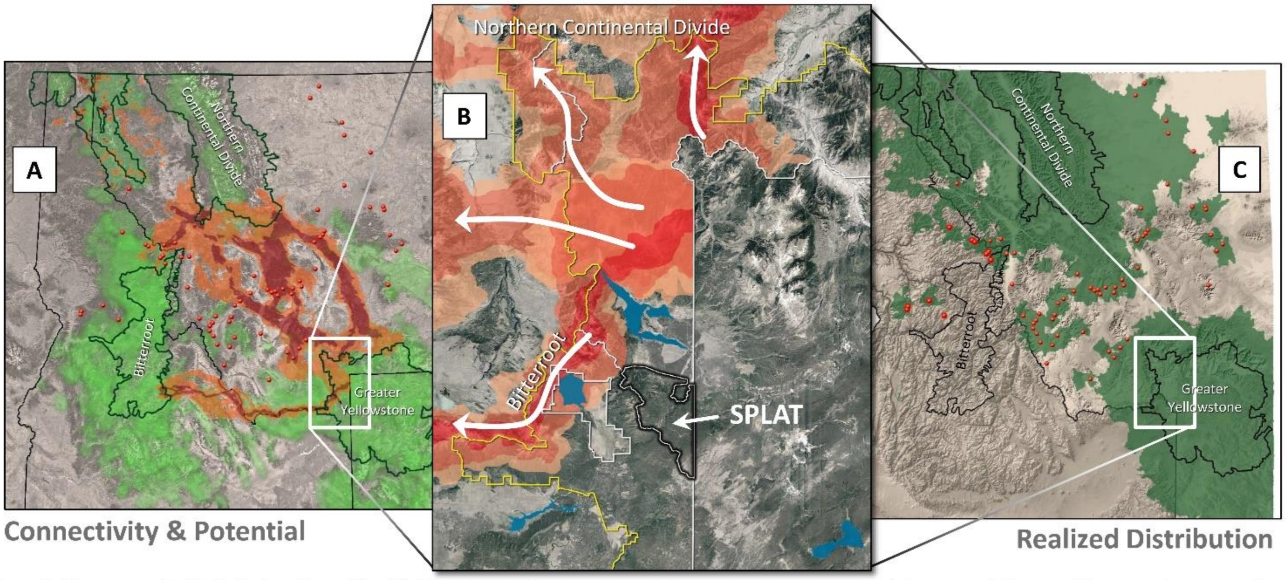

Figure 7. These maps highlight the location of the SPLAT project relative to potential dispersal routes among grizzly bear populations and Recovery Areas as well as the extent to which this potential has been realized by documented dispersers and associated areas where grizzly bears may be present. Map (A) shows the distribution of potential suitable habitat (in shades of green) and potential dispersal routes (in shades of orange) for grizzly bears in the U.S. Northern Rocky Mountains along with the distribution of dispersing/colonizing grizzly bears documented since 2005 (red dots). Potential suitable habitat is based on models that incorporate habitat productivity and remoteness from humans, with darker green indicating greater replication of results (from Merrill et al. [1999]; Carroll et al. [2001, 2003]; Merrill & Mattson [2003]; Mattson & Merrill [2004]; Merrill [2005]; and Craighead et al. [2005]). Dispersal routes were modeled by Walker & Craighead (1997), Servheen et al. (2001), Proctor et al. (2015), and Peck et al. (2017). Map (B) features the SPLAT project area relative to the Primary Conservation Area (in yellow), administrative boundaries (in white) and potential dispersal routes modeled by Walker & Craighead (1997). Map (C) features areas, denoted in dark green, where grizzly bears "may be present" (from a map published by the US Fish & Wildlife Service in December, 2020).

10.4. Collectively, these results show that, although the SPLAT project area is not in the center of potential dispersal routes for grizzly bears, it is near enough to be a potential contributor of dispersers, and also in an area contiguous with potential suitable habitat to the west.

10.5. Nonetheless, under current and planned conditions, the SPLAT project area will not contribute to dynamics fostering connectivity among grizzly bear ecosystems, and instead retard realization of the otherwise ample auspicious potential by continuing to function as a sink for the Yellowstone grizzly bear population (as per 9.1 and Figure 6a, above).

10.6. The SPLAT Environmental Assessment fails to seriously address the role that the project area plays in potential connectivity among grizzly bear ecosystems while at the same dismissing the best available science through an arbitrary and capricious rationale. The *Literature Consideration & Response* and *Comment Consideration & Response* reject the Walker & Craighead research out of hand because it is "not peer reviewed," Carroll et al. because it deals with planning, and Merrill & Mattson because it is presumably too coarse a scale. Parenthetically, SPLAT decision documents failed to address any of the other research or evidence relevant to connectivity referenced in this declaration.

10.7. As egregious, the US Forest Service dismissed the prospective functionality of connectivity along the Centennial Mountains and in the adjacent High Divide landscape with a figurative wave of

the bureaucratic hand, claiming that connectivity was preempted by the amount of private land. Not only did the Forest Service fail to offer any evidence for this assertion, but also ignored ample evidence to the contrary. Grizzly bears are, in fact, demonstrating the suitability of this landscape by taking up residence there (Figure 7c). Moreover, the proportion of private lands in conservation easements – as well as the prospective acceptance of grizzly bears by landowners in the High Divide – are demonstrably auspicious (Graves et al. 2019, Sage et al. 2022).

10.8. By default, the SPLAT analysis seems to assume that assertion based on no evidence or science whatsoever is superior for judging project impacts on connectivity and corridors compared to employing the best available science – which contravenes prudence, mandates of the ESA, and Gallatin Forest Plan Guideline/Standard FW-GDL-WL-01.

11. The SPLAT Environmental Assessment and Wildlife Report fail to adequately address the main reason why grizzly bears die on the Custer-Gallatin National Forest – lethal encounters with big game hunters.

11.1. Hunters are, per capita, predictably among the most lethal humans to any grizzly bears they encounter (as per Mattson et al. 1996). Hunters are often moving stealthily off-road or off-trail, armed, and with firearms typically loaded and at the ready. Surprise encounters or the contestation of carcasses with grizzly bears often turn out deadly for the involved bears (Ruth et al. 2003, Gunther et al. 2004, Haroldson et al. 2004, Servheen et al. 2009). Regardless of whether an encounter turns deadly, hunters are also among the most disruptive to bears of any people on foot (Mattson 2019).

11.2. These two reasons predictably explain why big game hunters have long been and continue to be the dominant human cause of grizzly bear deaths on the Custer-Gallatin National Forest (Figure 8; see 7.11, above). There are no indications that these deaths are declining either in prominence or in absolute numbers. If anything, the opposite is true.

11.3. Importantly, there is a close link between road access, the distribution of hunters, and resulting patterns of human-caused grizzly bear mortality, especially in areas typical of the SPLAT project (e.g., distribution of hunters vis-à-vis roads: Diefenbach et al. 2005, Keenan 2010, Stedman

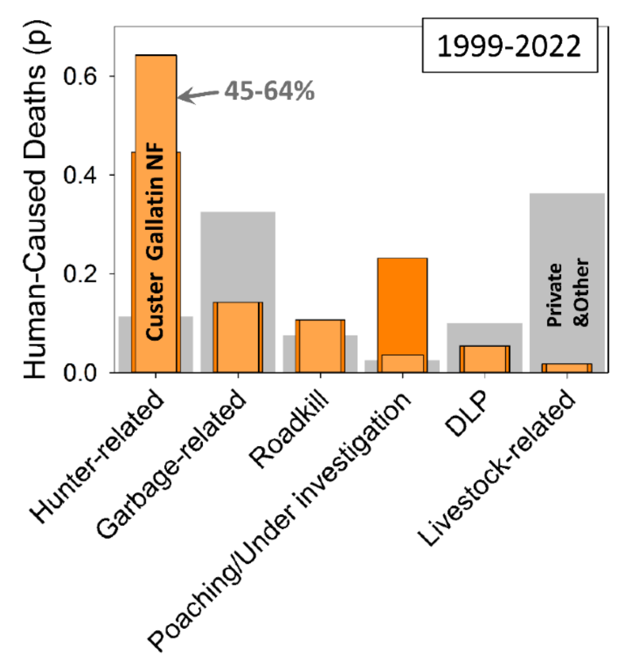

Figure 8. This bar graph shows the proportional frequency of different human-related causes of grizzly bear deaths during 1999-2022 on the CGNF (in orange) and adjacent private lands (in gray) in Montana. Natural causes or causes related to "accidents" and research captures are not included in the proportional break-down. I considered a grizzly bear death to be hunter-related if it likely wouldn't have happened but for the presence of a hunter with a gun, and in spite of sometimes being listed as in Defense of Life and Property. Given that the causes of mortalities still "under investigation" are not clear, but, by date, likely to be associated with bears encountering hunters, I allocated "under investigation deaths" in two ways. The dark orange bars allocate these problematic deaths to "Poaching/ Under Investigation," whereas the light orange bars allocate these deaths to "Hunter-related." Either way, hunter-related deaths account for around half of all grizzly bear deaths on the CGNF during the last 20 plus years.

et al. 2010, Lebel et al. 2012, Proffitt et al. 2013, Rosenburger 2020, Rowland et al. 2021; distribution of hunter-caused bears deaths vis-à-vis areas with road access: Mace & Waller 1998; Gunther et al. 2004; Ciarniello et al. 2009; Nielsen et al. 2004, 2010; Schwartz et al. 2010; Proctor et al. 2020). There is also plausibly a link between an increase in hunter-caused bear deaths and increasing reliance of grizzly bears on a meat-rich diet (see 7.11).

11.4. Despite the prominent role of big game hunters in causing grizzly bear deaths, the SPLAT Environmental Assessment and Wildlife Report make only passing reference to this factor in judging project impacts, as well as the demonstrable link between road and trail access and numbers and distributions of hunters (pages 30 & 44). The EA provides no statistics on trends in hunter numbers within the project area, or more explicitly how hunters are distributed; nor does the EA appear to give serious consideration to the risks posed by hunters.

11.5. Of relevance, the Wildlife Report and EA presume to judge risk of direct mortality posed by the SPLAT project by consulting a summary of grizzly bear deaths documented within a 24-km radius of the SPLAT project area during 2009-2018, inclusive of private lands and National Park jurisdictions. The analysts concluded that, because no hunter-caused deaths occurred in the proposed project area during this 10-year period, hunters using, or likely to use, the project area posed little risk to grizzly bears.

11.6. This reported grizzly bear mortality does not provide a sufficient basis for judging mortality risk, first, because causes are skewed by inclusion of private lands and Park Service jurisdictions, where configurations of risk are quite different compared to Forest Service jurisdictions (i.e., comparing apples and oranges; Figure 5), and, second, because the considered area is too small to accommodate a phenomenon as comparatively rare as human-caused grizzly bear deaths. The more appropriate basis for judging risk is to consider only Forest Service jurisdictions (i.e., comparing apples with apples) along with a longer temporal and larger spatial extent. Not only does this allow consideration of trend, but also provides a sample large enough to support reasonable inference, as per the data summarized in Figures 5 and 8.

11.7. More defensibly, the available data support concluding that hunters using the SPLAT project area pose a significant risk to grizzly bears, and that prudence would recommend taking actions that minimize this risk. Given the scope of US Forest Service authority, prudent measures would largely entail substantially (rather than minimally) reducing the amount of road and trail access in the SPLAT project area, both during and after project activities.

12. The SPLAT Environmental Assessment and Wildlife Report fail to use the best available science regarding effects of proposed vegetation treatments on grizzly bears.

12.1. The Wildlife Report repeats or otherwise makes several fallacious claims regarding the nature of grizzly bear foods and the adaptability of bears to variation in habitat conditions. First and foremost, citing Gunther et al. (2014), the Report claims that because grizzly bears are omnivores, essentially all foods can and will be used without regard for nutritional quality ("…feed on any available food"), rooted in the absurd notion that all bear foods are essentially equal. This presumably obviates any requirement to seriously engage with which specific foods will be impacted by the SPLAT project.

12.2. These claims are not supported by the best available scientific information. Bear foods vary widely in factors that affect quality, including nutrient content, digestibility, structure, and site-specific concentrations (Mattson et al. 2004). As has been shown repeatedly, all these factors have potentially orders-of-magnitude effects on the diet, foraging behaviors, and physical condition of bears (e.g., Pritchard & Robbins 1990, Welch et al. 1997, Rode et al. 2001, Felicetti et al. 2003, Erlenbach et al. 2014). Differences in the quality and quantities of specific foods substantially affect bears.

12.3. While acknowledging that grazed foods are of generally poor quality for bears, the Wildlife Report nonetheless concludes that "Increased understory vegetation production [resulting from the project] would benefit grizzly bears." The Report also makes claims regarding the importance of aspen stands and riparian areas to bears without offering any substantiation for why these vegetation types might be particularly important to grizzly bears, other than through speculated benefits to elk and the invocation of biodiversity in the abstract. These claims are the apparent basis for in turn claiming that enhancements to 162 acres of aspen stands (0.4% of the project area) together with timber harvest on another approximate 16,500 acres (>40% of the project area) would be beneficial for grizzly bear habitat.

Grizzly Bear Feeding Activities vs Weather & Forest Structure

	Forest Structure						Weather				
Feeding Activity	Total BA	Live BA	Lodgepole Pine BA	Dead BA	Woody Debris	Forest Edge	Current Month Temp	Current Month PPT	Cumulative PPT	Winter PPT	
Bedding		196						11.0		19.0	Mattson (2000)
Ants	24.0				22.5		31				Mattson (2001)
Wasps & Bees		13.0			4.5				63.5		Mattson (2002)
Mushrooms			23.6								Mattson et al. (2002)
Osmorhiza Roots	7.6										Mattson (2000)
Early Season Graminoids					2.5		38		9.2		Mattson (2000)
Late Season Graminoids	5.2					19.5					Mattson (2000)
Dandelions				5.2			12.5	10.3			Mattson (2000)
Ungulates - Spring		1.0				8				WSI	Mattson (2000)
Ungulates - Estrus		2.0				0.7			7		Mattson (2000)
Ungulates - Hyperphagia						9.7		10.1			Mattson (2000)

Figure 9. This matrix summarizes the results of research in the Yellowstone Ecosystem pertaining to relations between weather or vegetation structure and grizzly bear consumption of various foods. Day-time bedding is also included. Food and activities are featured known to be commonly consumed by grizzly bears in vegetation types typifying the SPLAT project area (from Mattson et al. 2004). Vegetation or weather features are arrayed across the top; feeding activities are arrayed along the side. Boxes colored shades of green denote positive relations between a vegetation or weather feature and a grizzly bear activity (i.e., more of the feature is associated with more of the activity). Orange boxes denote negative relations. The relative strength of each relationship is denoted by the number in each box; higher numbers indicate stronger relations. 'WSI' in the box relating Winter precipitation (PPT) to spring consumption of ungulates denotes a well-established positive relationship to Winter Severity mediated through the abundance of winter-killed ungulates. Sources for each relationship are referenced in the farthest right-hand column.

12.4. None of these claims regarding likely beneficial effects of the vegetation treatments proposed for the SPLAT project are supported by the best available science. For one, the most frequent grizzly bear activity in habitats typical of the SPLAT project – other than simply moving – is consuming

invertebrates, not grazing (Mattson et al. 2004). Day-time bedding and grazing are next-most common, followed by consumption of fungal sporocarps, meat from ungulates, and roots of excavated sweet-cicely (*Osmorhiza* spp.) (Mattson 1997c, 2000, 2001, 2002; Mattson et al. 2002, 2004). Of these activities, five are more likely to occur in forest stands, especially with greater total or live overstory basal area – in two instances positively associated with greater coarse woody debris (ants and wasps and bees, Figure 9). Of targeted lower-quality foods, only consumption of graminoids is more likely to occur in either more open stand conditions or where there is less woody debris. Consumption of ungulates, primarily elk, is more likely to occur in open conditions on winter ranges, which is minimally applicable to the SPLAT project area, whereas consumption of elk and moose the remainder of the year more often occurs under forested conditions – during fall, well inside forest cover where grizzly bears are better able to ambush rutting bulls (Schelyer 1983, Mattson 1997b).

12.5. Prospective impacts of the SPLAT project on abundance of huckleberries (*Vaccinium membranaceum*) warrants some consideration given that this food source is demonstrably important to grizzly bears in other ecosystems, and that grizzly bears in southwestern portions of the Greater Yellowstone Ecosystem are amongst the only in this region to historically eat significant amounts of huckleberries (Knight et al. 1984). To my knowledge, the only research specific to southwestern portions of the GYE has shown that huckleberry production is greater in more open forested areas compared to in harvest units, and, moreover, that grizzly bears tend to avoid clearcuts (Anderson 1994) – which is consistent with parenthetical reference made in the Wildlife Report to unpublished research by Rossii et al. (2020) regarding documented avoidance of clearcuts by grizzly bears during hyperphagia.

12.6. When summarized as aggregate per acre energetic return for a bear, none of the vegetation types typifying or likely to result from the SPLAT project stand out as being substantially more productive than any other (Mattson et al. 2004). There is also no indication from any research done in the Yellowstone Ecosystem that aspen or riparian areas are particularly beneficial for or selected by grizzly bears.

12.7. None of the publications sourced for the information in 12.4 and 12.5, above, other than Rossi et al. (2020), were cited or considered by the Wildlife Report. Moreover, the SPLAT Wildlife Report cherry-picked results of the heavily-cited Mattson (1997c) to support its conclusions regarding the benefits of early successional lodgepole pine-dominated habitats while at the same time extrapolating results from a study done in a wholly different ecosystem (northern British Columbia; Milakovic et al. [2012]) to support the same contention.

12.8. The analysis of how the SPLAT project will affect grizzly bear habitats and foods, as such, is thus not based on the best available science. Its summary conclusion that "…increased understory vegetation production [resulting from the project] would benefit grizzly bears" is not warranted; nor are the claimed benefits for bears arising from aspen stand enhancements. Restoration techniques for whitebark pine are yet to be proven, and would prospectively affect only 72 acres (0.2%) of the project area.

South Plateau 046211

13. The SPLAT Environmental Assessment and Wildlife Report fail to adequately assess likely impacts of proposed project activities on habitat security for grizzly bears.

13.1. The Forest Service understates likely impacts of the SPLAT project on habitat security for grizzly bears because (1) it employs an invalid, if not meaningless, methodology for calculating habitat security that predictably produces inflated estimates (see 7 and 8, above); (2) does not address the likely impacts of human foot and bicycling traffic; (3) understates the *prima facie* levels of cumulative impacts arising from activities within SPLAT project boundaries; and (4) fails to assess whether current and prospective future road closures are or will be effective.

13.2 There is a large body of research showing that impacts of foot traffic on grizzly bears can be substantial (reviewed by Mattson [2019]). For example, grizzly bears take flight from pedestrians during roughly 72% of encounters, with flight initiated at around 83 m from the involved person and covering an average distance of around 2 km. This distance notably spans nearly twice the diameter of areas deemed to be "secure" in the SPLAT Wildlife Report, even when 500-m buffers along roads are included. Longer-term impacts on movements and activity patterns can last 1-3 days (Mattson 2019).

13.3. Aside from reactions to specific encounters with people, ample research has shown that histories of trail and campsite use by people can have major effects on grizzly bear movements, activity patterns, and habitat selection, manifest in displacement and avoidance. One near-universal impact is an increase in nocturnal behavior. Related to this, reduced foraging efficiencies have been commonly documented, with declines in the range of 20-50% (Mattson 2019: Section 5). Avoidance of trails averages 270 m, whereas avoidance of campsites averages 550 m (Mattson 2019: Section 6).

13.4. The impacts of mountain bikers on grizzly bears are noteworthy (Mattson 2019: Section 8a). Encounters between grizzly bears and mountain bikers are at closer average distances compared to encounters involving people on foot; far more often involve females with dependent young; and far more often result in aggressive responses from the involved bears (Mattson 2019: Section 8a). The weight of available evidence indisputably shows that impacts of mountain bikers on grizzly bears are disproportionately severe compared to the impacts of other people involved in non-motorized activities, with attendant disproportionate risks for people on bikes (Mattson 2019: Section 8a). Numbers of people using mountain bikes have, moreover, increased substantially since 2000 (e.g., Corporate Research Associates 2010, Oswald 2017).

13.5. These impacts of foot traffic and bicyclists on bear behaviors are clearly of a magnitude comparable to the impacts of people on secondary roads, but were entirely neglected by the SPLAT project assessment of habitat security for grizzly bears and related mitigations. Related assertions made in the 2006 Gallatin National Forest Travel Management Plan ROD and SPLAT Wildlife Report that "impacts of non-motorized summer travel…were not significant issues" are patently indefensible.

13.6. The map in Figure 10 shows information presented in Figures 5 and 8 of the Wildlife Report, more specifically overlaying putatively secure grizzly bear habit with proposed vegetation treatments in the SPLAT project area. This overlay emphasizes the extent to which project activities will not only impact presumed secure habitat, but also, as important, everything in between these patches, with predictable negative effects on grizzly bears. Put another way, Figure 10 emphasizes the extent of

sustained industrial-scale human activity planned for the next 15 years, with prospectively >1,000 acres being directly impacted any given year by the noise of chainsaws and heavy equipment, not only along major feed routes and haul roads, but also dispersed over large areas on skid trails and landing areas.

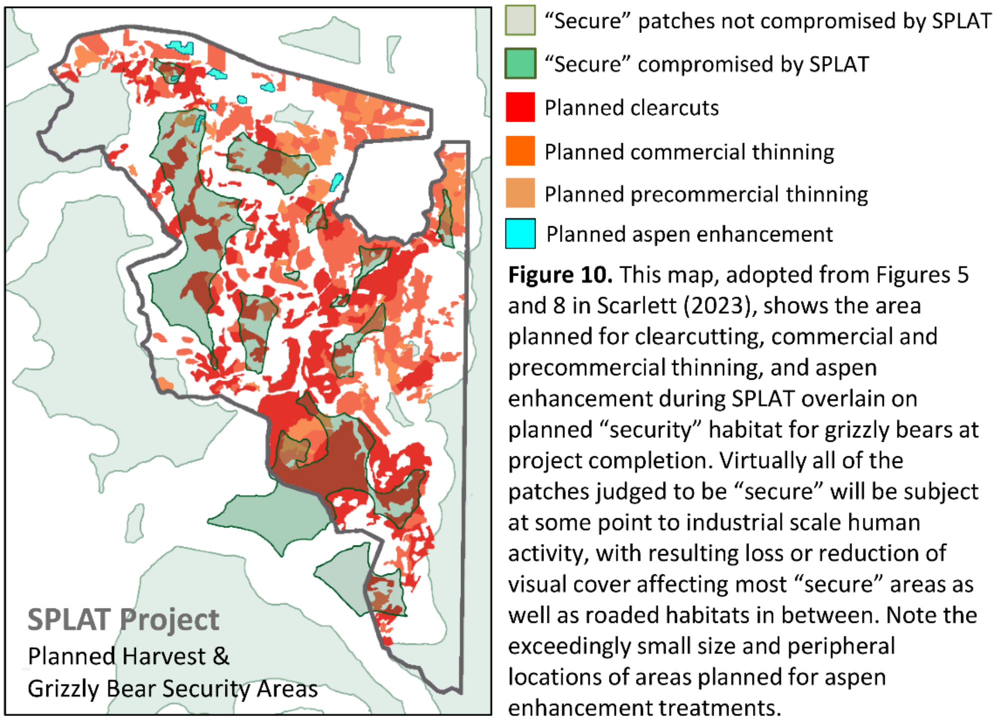

Figure 10. This map, adopted from Figures 5 and 8 in Scarlett (2023), shows the area planned for clearcutting, commercial and precommercial thinning, and aspen enhancement during SPLAT overlain on planned "security" habitat for grizzly bears at project completion. Virtually all of the patches judged to be "secure" will be subject at some point to industrial scale human activity, with resulting loss or reduction of visual cover affecting most "secure" areas as well as roaded habitats in between. Note the exceedingly small size and peripheral locations of areas planned for aspen enhancement treatments.

13.7. Industrial-scale levels of traffic on even peripheral road systems associated with an active project will almost certainly exceed the threshold of 5-20 vehicles per day at which bears exhibit substantial avoidance of secondary roads (Archibald et al. 1987, McLellan & Shackleton 1988, Kasworm & Manley 1990, Mace et al. 1996, Northrup et al. 2012). Selective citation of Wielgus et al. (2002) and Northrup et al. (2012) to focus on arguing against any impacts from administrative traffic on "closed" roads – as does the SPLAT Wildlife Report – does not obviate this fact.

13.8. The SPLAT Wildlife Report furthermore understates the prospective impacts entailed by removing much and, in places, even all security cover for grizzly bears over >40% of the project area. Several research projects have found that audio and visual screening as well as security cover are important to mitigating impacts of human activity on grizzly bears (Archibald et al. 1987; Gibeau et al. 2002; Roever et al. 2010; Ordiz et al. 2011; Skuban et al. 2018; Parsons et al. 2020, 2021). The self-evident as well as documented importance of cover to grizzly bear habitat security was first codified in the Yellowstone grizzly bear Cumulative Effects Model (US Forest Service 1985), and later in the 1994 Targhee National Forest Plateau BMU BO (US Fish & Wildlife Service 1994). Mattson et al. (2004) formalized the effects of cover on habitat alienation in terms of coefficients that decremented habitat effectiveness, not only by distance from human features, but also by whether there was screening by intervening forest.

13.9. Of relevance, the US Fish & Wildlife Service (1994) defined forest cover, sufficient for providing grizzly bears with visual security, as being conditions that hid 90% of a bear across >4-8 sighting distances.

13.10. The SPLAT analysis fails to consider the isolating and fragmenting effects of Highway 20 on grizzly bear movements and, because of that, both the capacity of grizzly bears to adjust to project-related human activities and thereby the magnitude of impacts. Of relevance to this point, traffic on Highway 20 near the project area substantially exceeds summer-time totals on US-2 (Montana Department of Transportation, Traffic Data-Reports), where near complete blockage of daytime grizzly bear movements was documented by Waller & Servheen (2005).

13.11. The SPLAT Wildlife Report as well as the 2022 Gallatin National Forest Biological Opinion recognize the importance of discriminating between roads that are theoretically versus functionally closed, not only for determining real levels of grizzly bear habitat security, but also for producing legally-defensible bureaucratic calculations of road densities. Even so, US Forest Service has not yet determined what portion of roads closed on paper are functionally closed in the SPLAT project area, and therefore have no reliable basis for determining existing levels of grizzly bear habitat security, even using current flawed methods.

13.12. The issue of discrepancies between roads that are closed on paper versus functionally closed has been a long-standing and important one in occupied grizzly bear habitat on Forest Service jurisdictions. Of specific relevance to the SPLAT project, a survey of the Madison BMU reported in 1994 revealed >36 miles of ghost roads, resulting in a >6% increase in total road mileage over that which was officially reported, and, even more importantly, that only 50% of roads putatively closed by barricades or other barriers were functionally closed (Skeele 1994). Taken together, the issue of ghost roads and ineffective closures potentially nullified the validity of any figures reported by the US Forest Service.

13.3. Because of the issues described above, statements in the SPLAT Wildlife Report and EA claiming that grizzly bears will somehow be able to accommodate all proposed project activities and residual impacts within the bounds of security-deficient semi-isolated Subunits or by moving considerable distances to other areas – all without incurring significant harm – are little more than assertions. Moreover, rather than being precautionary, these assertions are used to justify project actions that accentuate rather than ameliorate risks to grizzly bears, both short- and long-term.

14. Conclusions

14.1. It is my expert opinion that the US Forest Service analysis of the SPLAT project is not a valid basis for supporting its conclusions regarding how and to what extent individual grizzly bears, as well as the grizzly bear population in the contiguous U.S., will likely be affected because: (1) the grizzly bear population is not yet genetically and evolutionarily viable, despite Recovery Criteria having been met within the Greater Yellowstone PCA; (2) the 1998 baseline used to assess levels of habitat security within the PCA is premised on invalid assumptions; (3) the methods used to calculate habitat security produce inflated – if not altogether meaningless – estimates of true habitat security for grizzly bears; (4) the assessment of connectivity issues related to the project and achievement of population viability was arbitrary and capricious; and (5) the analysis of impacts on grizzly bear habitat quality and security within project boundaries was deficient for numerous reasons.

14.2. Given the facts of this declaration, it is my expert opinion that the following conclusion reported in the SPLAT Wildlife Report and EA **understates the magnitude and duration of more local impacts** on grizzly bears: "…secure habitat would be temporarily reduced below the already degraded secure habitat baseline in the Madison #2 and Henry's Lake #2 Subunits, the Proposed Action may affect, and is likely to adversely affect the grizzly bear."

14.3. Given the facts of this declaration, it is my expert opinion that the following conclusion reported in the SPLAT Wildlife Report as a basis for the Finding of No Significant Impact is **not valid, defensible, or precautionary**: "The effects described…do not represent a significant adverse effect on this species because they would largely be temporary, would provide for diverse food resources and forest structure in the long term, and would meet all Forest Plan standards related to grizzly bear and their habitat."

15. As currently proposed, it is my expert opinion that the South Plateau Landscape Area Treatment Project will not only harm numerous individual grizzly bears, but also adversely affect recovery and ultimate long-term viability of grizzly bears, not only in the Greater Yellowstone Ecosystem, but also the contiguous United States.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 30th day of April, 2023.

David J. Mattson

David J. Mattson, Ph.D.

DECLARATION OF DAVID J. MATTSON
Pertaining to Likely Effects of the South Plateau Landscape Area Treatment Project on Grizzly Bears

ATTACHMENT 1 – RELEVANT DOCUMENTS & SCIENTIFIC LITERATURE

Apps, C. D., McLellan, B. N., Woods, J. G., & Proctor, M. F. (2004). Estimating grizzly bear distribution and abundance relative to habitat and human influence. Journal of Wildlife Management, 68(1), 138-152.

Apps, C. D., McLellan, B. N., Proctor, M. F., Stenhouse, G. B., & Servheen, C. (2016). Predicting spatial variation in grizzly bear abundance to inform conservation. Journal of Wildlife Management, 80(3), 396-413.

Anderson, N.J. (1994) Grizzly bear food production on clearcuts within the western and northwestern Yellowstone ecosystem. M.S. Thesis, Montana State University, Bozeman, Montana. https://scholarworks.montana.edu/xmlui/bitstream/handle/1/7659/31762102666680.pdf?sequence=1

Archibald, W. R., Ellis, R., & Hamilton, A. N. (1987). Responses of grizzly bears to logging truck traffic in the Kimsquit River Valley, British Columbia. International Conference of Bear Research & Management, 7, 251-257.

ArcGIS US Historical Fire Perimeters from 2000-2018. https://www.arcgis.com/home/item.html?id=9c407d9f46624e98aa4fca1520a3a8f7

Aune, K., & Kasworm, W. F. (1989). East Front grizzly bear study; final report. Montana Department of Fish, Wildlife & Parks. Helena, Montana.

Benn, B., & Herrero, S. (2002). Grizzly bear mortality and human access in Banff and Yoho National Parks, 1971-98. Ursus, 13, 213-221.

Boulanger, J., Cattet, M., Nielsen, S. E., Stenhouse, G., & Cranston, J. (2013). Use of multi-state models to explore relationships between changes in body condition, habitat and survival of grizzly bears Ursus arctos horribilis. Wildlife Biology, 19(3), 274-288.

Boulanger, J., & Stenhouse, G. B. (2014). The impact of roads on the demography of grizzly bears in Alberta. PloS One, 9(12), e115535.

Berland, A., Nelson, T., Stenhouse, G., Graham, K., & Cranston, J. (2008). The impact of landscape disturbance on grizzly bear habitat use in the Foothills Model Forest, Alberta, Canada. Forest Ecology & Management, 256(11), 1875-1883.

Bischof, R., Steyaert, S. M., & Kindberg, J. (2017). Caught in the mesh: Roads and their network-scale impediment to animal movement. Ecography, 40(12), 1369-1380.

Blanchard, B. M. (1978). Grizzly bear distribution in relation to habitat areas and recreation use: Cabin Creek-Hilgard Mountains. M.S. Thesis, Montana State University, Bozeman, Montana.

Boulanger, J., & Stenhouse, G. B. (2014). The impact of roads on the demography of grizzly bears in Alberta. PLOS One, 9(12), e115535.

Boulanger, J., Nielsen, S. E., & Stenhouse, G. B. (2018). Using spatial mark-recapture for conservation monitoring of grizzly bear populations in Alberta. Scientific Reports, 8(1), 1-15. https://www.nature.com/articles/s41598-018-23502-3/

Brook, B. W., Traill, L. W., & Bradshaw, C. J. (2006). Minimum viable population sizes and global extinction risk are unrelated. Ecology Letters, 9(4), 375-382.

Cardillo, M., Purvis, A., Sechrest, W., Gittleman, J. L., Bielby, J., & Mace, G. M. (2004). Human population density and extinction risk in the world's carnivores. PLoS Biology, 2(7), e197.

Cardillo, M., Mace, G. M., Jones, K. E., Bielby, J., Bininda-Emonds, O. R., Sechrest, W., ... & Purvis, A. (2005). Multiple causes of high extinction risk in large mammal species. Science, 309(5738), 1239-1241.

Carroll, C., Noss, R. F., & Paquet, P. C. (2001). Carnivores as focal species for conservation planning in the Rocky Mountain region. Ecological Applications, 11(4), 961-980.

Carroll, C., Noss, R. F., Paquet, P. C., & Schumaker, N. H. (2003). Use of population viability analysis and reserve selection algorithms in regional conservation plans. Ecological Applications, 13(6), 1773-1789.

Chruszcz, B., Clevenger, A. P., Gunson, K. E., & Gibeau, M. L. (2003). Relationships among grizzly bears, highways, and habitat in the Banff-Bow Valley, Alberta, Canada. Canadian Journal of Zoology, 81(8), 1378-1391. https://www.nrcresearchpress.com/doi/abs/10.1139/z03-123#.X0-9ilVKiUk

Ciarniello, L. M., Boyce, M. S., Heard, D. C., & Seip, D. R. (2007). Components of grizzly bear habitat selection: density, habitats, roads, and mortality risk. Journal of Wildlife Management, 71(5), 1446-1457.

Ciarniello, L. M., Boyce, M. S., Seip, D. R., & Heard, D. C. (2009). Comparison of grizzly bear Ursus arctos demographics in wilderness mountains versus a plateau with resource development. Wildlife Biology, 15(3), 247-265.

Corporate Research Associates (2010). Secondary research—mountain biking market profiles: Final report. Corporate Research Associates. Accessed via: https://www.nemba.org/science-economics-trails-and-mountain-biking

Costello, C. M., van Manen, F. T., Haroldson, M. A., Ebinger, M. R., Cain, S. L., Gunther, K. A., & Bjornlie, D. D. (2014). Influence of whitebark pine decline on fall habitat use and movements of grizzly bears in the Greater Yellowstone Ecosystem. Ecology & Evolution, 4(10), 2004-2018.

Costello, C. M., Cain, S. L., Pils, S., Frattaroli, L., Haroldson, M. A., & Van Manen, F. T. (2016). Diet and macronutrient optimization in wild ursids: a comparison of grizzly bears with sympatric and allopatric black bears. PLoS One, 11(5), e0153702.

Craighead, L., Gilbert, B., & Olenicki, T. (2005). Comments submitted to the US Fish and Wildlife Service regarding delisting of the Yellowstone Grizzly Bear DPS, Federal Register. Vol. 70, No. 221. (November 17, 2005): 69853–69884.

Craighead, L., & Olenicki, T. (2006). Modeling highway impacts related to grizzly bear core, living, and connectivity habitat in Idaho, Montana, and Wyoming using a two-scale approach. Pages 287-291 in Proceedings of the 2005 International Conference on Ecology & Transportation. Irwin, C. L., Garrett, P., & McDermott, K. P. (eds). Center for Transportation & the Environment, North Carolina State University, Raleigh, North Carolina.

Cristescu, B., Stenhouse, G. B., & Boyce, M. S. (2013). Perception of human-derived risk influences choice at top of the food chain. PLoS One, 8(12), e82738.

Diefenbach, D. R., Finley, J. C., Luloff, A. E., Stedman, R., Swope, C. B., Zinn, H. C., & San Julian, G. J. (2005). Bear and deer hunter density and distribution on public land in Pennsylvania. Human Dimensions of Wildlife, 10(3), 201-212.

Doak, D. F. (1995). Source-sink models and the problem of habitat degradation: general models and applications to the Yellowstone grizzly. Conservation Biology, 9, 1370-1379.

Doak, D. F., & Cutler, K. (2014a). Re-evaluating evidence for past population trends and predicted dynamics of Yellowstone grizzly bears. Conservation Letters, 7(3), 312-322.

Doak, D. F., & Cutler, K. (2014b). Van Manen et al., Doth Protest too Much: New Analyses of the Yellowstone Grizzly Population Confirm the Need to Reevaluate Past Population Trends. Conservation Letters, 7(3), 332-333.

Eberhardt, L. L., Blanchard, B. M., & Knight, R. R. (1994). Population trend of the Yellowstone grizzly bear as estimated from reproductive and survival rates. Canadian Journal of Zoology, 72(2), 360-363.

Ebinger, M. R., Haroldson, M. A., van Manen, F. T., Costello, C. M., Bjornlie, D. D., Thompson, D. J., ... & White, P. J. (2016). Detecting grizzly bear use of ungulate carcasses using global positioning system telemetry and activity data. Oecologia, 181(3), 695-708.

EcoWest, The Human Footprint in the American West. http://ecowest.org/2013/05/01/human-footprint-in-west/

Erlenbach, J. A., Rode, K. D., Raubenheimer, D., & Robbins, C. T. (2014). Macronutrient optimization and energy maximization determine diets of brown bears. Journal of Mammalogy, 95(1), 160-168.

Felicetti, L. A., Robbins, C. T., & Shipley, L. A. (2003). Dietary protein content alters energy expenditure and composition of the mass gain in grizzly bears (Ursus arctos horribilis). Physiological and Biochemical Zoology, 76(2), 256-261.

Frankham, R., & Brook, B. W. (2004). The importance of time scale in conservation biology and ecology. Annales Zoologici Fennici, 41, 459-463.

Frankham, R. (2005). Genetics and extinction. Biological Conservation, 126(2), 131-140.

Frankham, R., Bradshaw, C. J., & Brook, B. W. (2014). Genetics in conservation management: revised recommendations for the 50/500 rules, Red List criteria and population viability analyses. Biological Conservation, 170, 56-63.

Gallatin National Forest (2006). Gallatin National Forest Travel Management Plan: Record of Decision. USDA Forest Service, Gallatin National Forest, Bozeman, Montana.

Geremia, C. (2020). Bison conservation update. U.S. National Park Service, Yellowstone National Park, Mammoth, Wyoming.

Gibeau, M. L., Herrero, S., McLellan, B. N., & Woods, J. G. (2001). Managing for grizzly bear security areas in Banff National Park and the Central Canadian Rocky Mountains. Ursus, 12, 121-129.

Graham, K., Boulanger, J., Duval, J., & Stenhouse, G. (2010). Spatial and temporal use of roads by grizzly bears in west-central Alberta. Ursus, 21(1), 43-56.

Graves, R. A., Williamson, M. A., Belote, R. T., & Brandt, J. S. (2019). Quantifying the contribution of conservation easements to large-landscape conservation. Biological Conservation, 232, 83-96.

Green, G. I., Mattson, D. J., & Peek, J. M. (1997). Spring feeding on ungulate carcasses by grizzly bears in Yellowstone National Park. Journal of Wildlife Management, 61(4), 1040-1055.

Gunther, K. A. (1994). Bear management in Yellowstone National Park, 1960-93. International Conference on Bear Research & Management, 9, 549-560.

Gunther, K. A., & Hoekstra, H. E. (1998). Bear-inflicted human injuries in Yellowstone National Park, 1970-1994. Ursus, 10, 377-384.

Gunther, K. A., Haroldson, M. A., Frey, K., Cain, S. L., Copeland, J., & Schwartz, C. C. (2004). Grizzly bear–human conflicts in the Greater Yellowstone ecosystem, 1992–2000. Ursus, 15(1), 10-22.

Gunther, K. A., Shoemaker, R. R., Frey, K. L., Haroldson, M. A., Cain, S. L., Van Manen, F. T., & Fortin, J. K. (2014). Dietary breadth of grizzly bears in the Greater Yellowstone Ecosystem. Ursus, 25(1), 60-72.

Gunther, K. (2019). Yellowstone National Park recreational use. Pages 58-61 in Van Manen, F. T., Haroldson, M. A., & Karabensh, B. E. (eds). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2018. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M. A., & Gunther, K. A. (2013). Roadside bear viewing opportunities in Yellowstone National Park: characteristics, trends, and influence of whitebark pine. Ursus, 24(1), 27-41.

Haroldson, M. S. Tement, M., Holm, G., Swalley, R. A., Podruzny, S., Moody, D., & Schwartz. C. C. (1998). Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 1997. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M. A., Schwartz, C. C., Cherry, S., & Moody, D. S. (2004). Possible effects of elk harvest on fall distribution of grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management, 68(1), 129-137.

Harris, R. B., Schwartz, C. C., Haroldson, M. A., & White, G. C. (2006). Trajectory of the Yellowstone grizzly bear population under alternative survival rates. Wildlife Monographs, (161), 44-56.

Johnson, C. J., Boyce, M. S., Schwartz, C. C., & Haroldson, M. A. (2004). Modeling survival: application of the Andersen-Gill model to Yellowstone grizzly bears. Journal of Wildlife Management, 68(4), 966-978.

Kasworm, W. F., & Manley, T. L. (1990). Road and trail influences on grizzly bears and black bears in northwest Montana. International Conference of Bear Research & Management, 9, 79-84.

Kearney, S. P., Coops, N. C., Stenhouse, G. B., Nielsen, S. E., Hermosilla, T., White, J. C., & Wulder, M. A. (2019). Grizzly bear selection of recently harvested forests is dependent on forest recovery rate and landscape composition. Forest Ecology & Management, 449, 117459.

Keenan, M. T. (2010). Hunter distribution and harvest of female white-tailed deer in Pennsylvania. M.S. Thesis, The Pennsylvania State University, State College, Pennsylvania.

Knight, R. R., Mattson, D. J., & Blanchard, B. M. (1984). Movements and habitat use of the Yellowstone grizzly bear. U.S. National Park Service, Bozeman, Montana.

Knight, R. R., Blanchard, B. M., & Eberhardt, L. L. (1988). Mortality patterns and population sinks for Yellowstone grizzly bears, 1973-1985. Wildlife Society Bulletin, 16(2), 121-125. https://www.jstor.org/stable/3782177

Knight, R. R., Blanchard, B. M., & Mattson, D. J. (1989). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1988. National Park Service, Bozeman, Montana.

Knight, R. R., Blanchard, B. M., & Mattson, D. J. (1990). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1989. National Park Service, Bozeman, Montana.

Knight, R. R., Blanchard, B. M., & Mattson, D. J. (1991). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1990. National Park Service, Bozeman, Montana.

Knight, R. R., Blanchard, B. M., & Mattson, D. J. (1992). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1991. National Park Service, Bozeman, Montana. https://www.usgs.gov/centers/norock/science/igbst-annual-reports?qt-science_center_objects=7#qt-science_center_objects

Knight, R. R., Blanchard, B. M., & Mattson, D. J. (1993). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1992. National Park Service, Bozeman, Montana.

Knight, R. R., & Blanchard, B. M. (1994). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1993. National Biological Service, Bozeman, Montana.

Knight, R. R., & Blanchard, B. M. (1995). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1994. National Biological Service, Bozeman, Montana.

Knight, R. R., & Blanchard, B. M. (1996). Yellowstone grizzly bear investigations: annual report of the Interagency Study Team, 1995. National Biological Service, Bozeman, Montana.

Knight, R. R., Blanchard, B. M., & Haroldson, M. A. (1997). Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 1996. U.S. Geological Survey, Bozeman, Montana.

Ladle, A., Avgar, T., Wheatley, M., Stenhouse, G. B., Nielsen, S. E., & Boyce, M. S. (2019). Grizzly bear response to spatio-temporal variability in human recreational activity. Journal of Applied Ecology, 56(2), 375-386.

Lamb, C. T., Mowat, G., McLellan, B. N., Nielsen, S. E., & Boutin, S. (2017). Forbidden fruit: human settlement and abundant fruit create an ecological trap for an apex omnivore. Journal of Animal Ecology, 86(1), 55-65.

Lamb, C. T., Mowat, G., Reid, A., Smit, L., Proctor, M., McLellan, B. N., ... & Boutin, S. (2018). Effects of habitat quality and access management on the density of a recovering grizzly bear population. Journal of Applied Ecology, 55(3), 1406-1417.

Lamb, C. T., Ford, A. T., McLellan, B. N., Proctor, M. F., Mowat, G., Ciarniello, L., ... & Boutin, S. (2020). The ecology of human–carnivore coexistence. Proceedings of the National Academy of Sciences, 117(30), 17876-17883.

Lande, R. (1995). Mutation and conservation. Conservation Biology, 9(4), 782-791.

Lebel, F., Dussault, C., Massé, A., & Côté, S. D. (2012). Influence of habitat features and hunter behavior on white-tailed deer harvest. Journal of wildlife management, 76(7), 1431-1440.

Linke, J., McDermid, G. J., Fortin, M. J., & Stenhouse, G. B. (2013). Relationships between grizzly bears and human disturbances in a rapidly changing multi-use forest landscape. Biological Conservation, 166, 54-63.

Mace, R. D., Waller, J. S., Manley, T. L., Lyon, L. J., & Zuuring, H. (1996). Relationships among grizzly bears, roads and habitat in the Swan Mountains Montana. Journal of Applied Ecology, 33(6), 1395-1404. f

Mace, R. D., & Waller, J. S. (1998). Demography and population trend of grizzly bears in the Swan Mountains, Montana. Conservation Biology, 12(5), 1005-1016.

Mace, R. D., Waller, J. S., Manley, T. L., Ake, K., & Wittinger, W. T. (1999). Landscape evaluation of grizzly bear habitat in western Montana. Conservation Biology, 13(2), 367-377.

Macfarlane, W. W., Logan, J. A., & Kern, W. R. (2013). An innovative aerial assessment of Greater Yellowstone Ecosystem mountain pine beetle-caused whitebark pine mortality. Ecological Applications, 23(2), 421-437.

Martin, J., Basille, M., Van Moorter, B., Kindberg, J., Allaine, D., & Swenson, J. E. (2010). Coping with human disturbance: spatial and temporal tactics of the brown bear (Ursus arctos). Canadian Journal of Zoology, 88(9), 875-883.

Martin, P. A. (1979). Productivity and taxonomy of the Vaccinium globulare V. membranaceum complex in western Montana. M.S. Thesis, University of Montana, Missoula, Montana. https://scholarworks.umt.edu/etd/7398/

Martin, P. (1983). Factors influencing globe huckleberry fruit production in northwestern Montana. International Conference of Bear Research & Management, 5, 159-165.

Mattson, D. J., Knight, R. R., & Blanchard, B. M. (1986). Derivation of habitat component values for the Yellowstone grizzly bear. Pages 222-229 in Contreras, G. P., & Evans, K. E. (eds). Proceedings—Grizzly Bear Habitat Symposium. U.S. Forest Service, Intermountain Research Station, General Technical Report INT-207. https://www.researchgate.net/publication/294229361_Derivation_of_habitat_component_values_for_the_Yellowstone_grizzly_bear

Mattson, D. J., Knight, R. R., & Blanchard, B. M. (1987). The effects of developments and primary roads on grizzly bear habitat use in Yellowstone National Park, Wyoming. International Conference on Bear Research & Management, 7, 259-273.

Mattson, D. J., & Knight, R. R. (1991). Application of cumulative effects analysis to the Yellowstone grizzly bear population. Interagency Grizzly Bear Study Team Report, 1991C, Interagency Grizzly Bear Study Team, Bozeman, Montana. https://www.researchgate.net/publication/344047295_Application_of_Cumulative_Effects_Analysis_to_the_Yellowstone_Grizzly_Bear_Population

Mattson, D. J., Blanchard, B. M., & Knight, R. R. (1991). Food habits of Yellowstone grizzly bears, 1977–1987. Canadian Journal of Zoology, 69(6), 1619-1629.

Mattson, D. J., Blanchard, B. M., & Knight, R. R. (1992). Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. Journal of Wildlife Management, 56(3), 432-442.

Mattson, D. J. (1993). Background and proposed standards for managing grizzly bear habitat security in the Yellowstone Ecosystem. Cooperative Park Studies Unit, College of Forestry, Wildlife & Range Sciences, University of Idaho, Moscow, Idaho. https://www.researchgate.net/publication/332448739_BACKGROUND_AND_PROPOSED_STANDARDS_FOR_MANAGING_GRIZZLY_BEAR_HABITAT_SECURITY_IN_THE_YELLOWSTONE_ECOSYSTEM

Mattson, D. J., Reinhart, D. P., & Blanchard, B. M. (1994). Variation in production and bear use of whitebark pine seeds in the Yellowstone area. Pages 205-220 in Despain, D. G. (ed). Plants and their environments: proceedings of the First Biennial Scientific Conference on the Greater Yellowstone Ecosystem. U.S. National Park Service, Denver, Colorado. https://www.researchgate.net/publication/344047278_Variation_in_Production_and_Bear_Use_of_Whitebark_Pine_Seeds_in_the_Yellowstone_Area

Mattson, D. J., Herrero, S., Wright, R. G., & Pease, C. M. (1996). Science and management of Rocky Mountain grizzly bears. Conservation Biology, 10(4), 1013-1025.

Mattson, D. J. (1997a). Sustainable grizzly bear mortality calculated from counts of females with cubs-of-the-year: an evaluation. Biological Conservation, 81(1-2), 103-111.

Mattson, D. J. (1997b). Use of ungulates by Yellowstone grizzly bears Ursus arctos. Biological Conservation, 81(1-2), 161-177.

Mattson, D. J. (1997c). Use of lodgepole pine cover types by Yellowstone grizzly bears. Journal of Wildlife Management, 61(2), 480-496. https://www.jstor.org/stable/3802606

Mattson, D. J. (1998). Changes in mortality of Yellowstone's grizzly bears. Ursus, 10, 129-138.

Mattson, D.J. (2000). Causes and consequences of dietary differences among Yellowstone grizzly bears (Ursus arctos). Ph.D. Dissertation, University of Idaho, Moscow, ID. 173 pp. https://www.researchgate.net/publication/327868803_Causes_and_Consequences_of_Dietary_Differences_among_Yellowstone_Grizzly_Bears_Ursus_arctos

Mattson, D. J. (2001). Myrmecophagy by Yellowstone grizzly bears. Canadian Journal of Zoology, 79(5), 779-793.

Mattson, D. J. (2002). Consumption of wasps and bees by Yellowstone grizzly bears. Northwest Science, 76(2), 166-172.

Mattson, D. J., Podruzny, S. R., & Haroldson, M. A. (2002). Consumption of fungal sporocarps by Yellowstone grizzly bears. Ursus, 13, 95-103.

Mattson, D.J., K. Barber, R. Maw & R. Renkin (2004). Coefficients of Productivity for Yellowstone's Grizzly Bear Habitat. U.S. Geological Survey, Biological Resources Discipline Biological Science Report USGS/BRD/BSR-2002-0007. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.359.9202&rep=rep1&type=pdf

Mattson, D. J. (2019). Effects of pedestrians on grizzly bears: an evaluation of the effects of hikers, hunters, photographers, campers, and watchers. Grizzly Bear Recovery Project Report GBRP-2019-3. https://www.researchgate.net/publication/335383762_Effects_of_Pedestrians_on_Grizzly_Bears_2019

McLellan, B. N., & Shackleton, D. M. (1988). Grizzly bears and resource-extraction industries: effects of roads on behaviour, habitat use and demography. Journal of Applied Ecology, 25, 451-460.

McLellan, B. N., Hovey, F. W., Mace, R. D., Woods, J. G., Carney, D. W., Gibeau, M. L., ... & Kasworm, W. F. (1999). Rates and causes of grizzly bear mortality in the interior mountains of British Columbia, Alberta, Montana, Washington, and Idaho. Journal of Wildlife Management, 63(3), 911-920.

Merrill, T., Mattson, D. J., Wright, R. G., & Quigley, H. B. (1999). Defining landscapes suitable for restoration of grizzly bears Ursus arctos in Idaho. Biological Conservation, 87(2), 231-248.

Merrill, T., & Mattson, D. (2003). The extent and location of habitat biophysically suitable for grizzly bears in the Yellowstone region. Ursus, 14, 171-187.

Middleton, A. D., Morrison, T. A., Fortin, J. K., Robbins, C. T., Proffitt, K. M., White, P. J., ... & Kauffman, M. J. (2013). Grizzly bear predation links the loss of native trout to the demography of migratory elk in Yellowstone. Proceedings of the Royal Society of London B: Biological Sciences, 280(1762), 20130870.

Milakovic, B., Parker, K.L., Gustine, D.D., Lay, R.J., Walker, A.B.D., & Gillingham, M. P. (2012). Seasonal habitat use and selection by grizzly bears in northern British Columbia. Journal of Wildlife Management, 76(1), 170–180.

Mueller, C., Herrero, S., & Gibeau, M. L. (2004). Distribution of subadult grizzly bears in relation to human development in the Bow River Watershed, Alberta. Ursus, 15(1), 35-47.

Nielsen, S. E., Herrero, S., Boyce, M. S., Mace, R. D., Benn, B., Gibeau, M. L., & Jevons, S. (2004). Modelling the spatial distribution of human-caused grizzly bear mortalities in the Central Rockies ecosystem of Canada. Biological Conservation, 120(1), 101-113.

Nielsen, S. E., Stenhouse, G. B., & Boyce, M. S. (2006). A habitat-based framework for grizzly bear conservation in Alberta. Biological Conservation, 130(2), 217-229.

Nielsen, S. E., McDermid, G., Stenhouse, G. B., & Boyce, M. S. (2010). Dynamic wildlife habitat models: seasonal foods and mortality risk predict occupancy-abundance and habitat selection in grizzly bears. Biological Conservation, 143(7), 1623-1634.

Montana Department of Transportation, Traffic Data. https://mdt.mt.gov/publications/datastats/traffic_maps.shtml

Naidoo, R., & Burton, A. C. (2020). Relative effects of recreational activities on a temperate terrestrial wildlife assemblage. Conservation Science & Practice, 2020, e271.

Nielsen, S. E., McDermid, G., Stenhouse, G. B., & Boyce, M. S. (2010). Dynamic wildlife habitat models: seasonal foods and mortality risk predict occupancy-abundance and habitat selection in grizzly bears. Biological Conservation, 143(7), 1623-1634.

NOAA National Centers for Environmental Information. https://www.ncdc.noaa.gov/cag/divisional/time-series

Northrup, J. M., Pitt, J., Muhly, T. B., Stenhouse, G. B., Musiani, M., & Boyce, M. S. (2012). Vehicle traffic shapes grizzly bear behaviour on a multiple-use landscape. Journal of Applied Ecology, 49(5), 1159-1167.

O'Grady, J. J., Brook, B. W., Reed, D. H., Ballou, J. D., Tonkyn, D. W., & Frankham, R. (2006). Realistic levels of inbreeding depression strongly affect extinction risk in wild populations. Biological Conservation, 133(1), 42-51.

Ordiz, A., Kindberg, J., Sæbø, S., Swenson, J. E., & Støen, O. G. (2014). Brown bear circadian behavior reveals human environmental encroachment. Biological Conservation, 173, 1-9.

Ordiz, A., Sæbø, S., Kindberg, J., Swenson, J. E., & Støen, O. G. (2017). Seasonality and human disturbance alter brown bear activity patterns: implications for circumpolar carnivore conservation?. Animal Conservation, 20(1), 51-60.

Oswald, L. (16 February 2017). Assessment Forest Plan Revision: Final Recreation Settings, Opportunities, and Access Report. USDA Custer Gallatin National Forest, Bozeman, Montana.

Parsons, B. M., Coops, N. C., Stenhouse, G. B., Burton, A. C., & Nelson, T. A. (2020). Building a perceptual zone of influence for wildlife: delineating the effects of roads on grizzly bear movement. European Journal of Wildlife Research, 66, 1-16.

Parsons, B. M., Coops, N. C., Kearney, S. P., Burton, A. C., Nelson, T. A., & Stenhouse, G. B. (2021). Road visibility influences habitat selection by grizzly bears (Ursus arctos horribilis). Canadian Journal of Zoology, 99(3), 161-171.

Pease, C. M., & Mattson, D. J. (1999). Demography of the Yellowstone grizzly bears. Ecology, 80(3), 957-975.

Peck, C. P., van Manen, F. T., Costello, C. M., Haroldson, M. A., Landenburger, L. A., Roberts, L. L., ... & Mace, R. D. (2017). Potential paths for male-mediated gene flow to and from an isolated grizzly bear population. Ecosphere, 8(10), e01969.

Penteriani, V., Delgado, M. D. M., Krofel, M., Jerina, K., Ordiz, A., Dalerum, F., ... & Bombieri, G. (2018). Evolutionary and ecological traps for brown bears Ursus arctos in human-modified landscapes. Mammal Review, 48(3), 180-193.

Pigeon, K. E., Cardinal, E., Stenhouse, G. B., & Côté, S. D. (2016). Staying cool in a changing landscape: the influence of maximum daily ambient temperature on grizzly bear habitat selection. Oecologia, 181(4), 1101-1116.

Podruzny, S. (2012). Use of diminished whitebark pine resources by adult female grizzly bears in the Taylor Fork area of the Gallatin National Forest, Montana, 2011. Pages 41-44 in Van Manen, F. T., Haroldson, M. A., & West, K. (eds). Yellowstone grizzly bear investigations: Annual report of the Interagency Grizzly Bear Study Team 2011. U.S. Geological Survey, Bozeman, Montana.

Pritchard, G. T., & Robbins, C. T. (1990). Digestive and metabolic efficiencies of grizzly and black bears. Canadian Journal of Zoology, 68(8), 1645-1651.

Proctor, M. F., Lamb, C. T., & MacHutchon, A. G. (2017). The grizzly dance between berries and bullets: relationships among bottom-up food resources and top-down mortality risk on grizzly bear populations in southeast British Columbia. Trans-border Grizzly Bear Project, Kaslo, British Columbia, Canada. http://transbordergrizzlybearproject.ca/pdf/Proctor%20et%20al%202017.pdf

Proctor, M. F., McLellan, B. N., Stenhouse, G. B., Mowat, G., Lamb, C. T., & Boyce, M. S. (2020). Effects of roads and motorized human access on grizzly bear populations in British Columbia and Alberta, Canada. Ursus, 30, 16-39.

Proffitt, K. M., Gude, J. A., Hamlin, K. L., & Messer, M. A. (2013). Effects of hunter access and habitat security on elk habitat selection in landscapes with a public and private land matrix. Journal of Wildlife Management, 77(3), 514-524.

Puchlerz, T., & Servheen, C. (1994). Grizzly bear motorized access management: Interagency Grizzly Bear Committee taskforce report. US Forest Service and US Fish & Wildlife Service, Missoula, Montana.

Reed, D. H., O'Grady, J. J., Brook, B. W., Ballou, J. D., & Frankham, R. (2003). Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. Biological Conservation, 113(1), 23-34.

Reed, J. M., & McCoy, E. D. (2014). Relation of minimum viable population size to biology, time frame, and objective. Conservation Biology, 28(3), 867-870.

Rode, K. D., Robbins, C. T., & Shipley, L. A. (2001). Constraints on herbivory by grizzly bears. Oecologia, 128, 62-71.

Roever, C. L., Boyce, M. S., & Stenhouse, G. B. (2008a). Grizzly bears and forestry: I: Road vegetation and placement as an attractant to grizzly bears. Forest Ecology & Management, 256(6), 1253-1261.

Roever, C. L., Boyce, M. S., & Stenhouse, G. B. (2008b). Grizzly bears and forestry: II: grizzly bear habitat selection and conflicts with road placement. Forest Ecology & Management, 256(6), 1262-1269.

Roever, C. L., Boyce, M. S., & Stenhouse, G. B. (2010). Grizzly bear movements relative to roads: application of step selection functions. Ecography, 33(6), 1113-1122.

Rogers, S. A., Robbins, C. T., Mathewson, P. D., Carnahan, A. M., van Manen, F. T., Haroldson, M. A., ... & Long, R. A. (2021). Thermal constraints on energy balance, behaviour and spatial distribution of grizzly bears. Functional Ecology, 35(2), 398-410.

Rosenberger, J. P., Little, A. R., Edge, A. C., Yates, C. J., Osborn, D. A., Killmaster, C. H., ... & D'Angelo, G. J. (2022). Resource selection of deer hunters in Georgia's Appalachian Mountains. Wildlife Society Bulletin, 46(4), e1356.

Rossi, J., Bailey, N., Tyers, D., van Manen, F.T., & Sowell, B. (2020). Grizzly bear use of clearcuts and food habits in Island Park, Idaho. Final Report to: U.S. Forest Service - Caribou-Targhee National Forest, Idaho Department of Fish & Game, Idaho Department of Transportation, and Interagency Grizzly Bear Study Team.

Rowland, M. M., Nielson, R. M., Wisdom, M. J., Johnson, B. K., Findholt, S., Clark, D., ... & Naylor, B. J. (2021). Influence of landscape characteristics on hunter space use and success. Journal of Wildlife Management, 85(7), 1394-1409.

Ruth, T. K., Smith, D. W., Haroldson, M. A., Buotte, P. C., Schwartz, C. C., Quigley, H. B., ... & Frey, K. (2003). Large-carnivore response to recreational big-game hunting along the Yellowstone National Park and Absaroka-Beartooth Wilderness boundary. Wildlife Society Bulletin, 31(4), 1150-1161.

Sage, A. H., Hillis, V., Graves, R. A., Burnham, M., & Carter, N. H. (2022). Paths of coexistence: Spatially predicting acceptance of grizzly bears along key movement corridors. Biological Conservation, 266, 109468.

Sawaya, M. A., Ramsey, A. B., & Ramsey, P. W. (2017). American black bear thermoregulation at natural and artificial water sources. Ursus, 27(2), 129-135.

Scarlett, R. (2023). South Plateau Landscape Area Treatment Project: Wildlife report. U.S. Forest Service, Bozeman, Montana.

Schleyer, B. O. (1983). Activity patterns of grizzly bears in the Yellowstone ecosystem and their reproductive behavior, predation and the use of carrion. M.S. Thesis, Montana State University, Bozeman, Montana.

Schwartz, C. C., Fortin, J. K., Teisberg, J. E., Haroldson, M. A., Servheen, C., Robbins, C. T., & Van Manen, F. T. (2014). Body and diet composition of sympatric black and grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management, 78(1), 68-78.

Schwartz, C. C., & Haroldson, M. A., eds. (1999). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 1998. U.S. Geological Survey, Bozeman, Montana. s

Schwartz, C. C., & Haroldson, M. A., eds. (2000). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 1999. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., eds. (2001). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2000. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., eds. (2002). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2001. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., eds. (2003). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2002. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., & West, K., eds. (2004). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2003. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., & West, K., eds. (2005). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2004. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., & West, K., eds. (2006). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2005. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., & West, K., eds. (2007). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2006. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., & West, K., eds. (2008). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2007. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., & West, K., eds. (2009). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2008. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., & Haroldson, M. A., & West, K., eds. (2010). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2009. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., Haroldson, M. A., & White, G. C. (2010). Hazards affecting grizzly bear survival in the Greater Yellowstone Ecosystem. Journal of Wildlife Management, 74(4), 654-667.

Schwartz, C. C., Haroldson, M. A., & West, K., eds. (2011). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2010. U.S. Geological Survey, Bozeman, Montana.

Schwartz, C. C., Haroldson, M. A., White, G. C., Harris, R. B., Cherry, S., Keating, K. A., ... & Servheen, C. (2006). Temporal, spatial, and environmental influences on the demographics of grizzly bears in the Greater Yellowstone Ecosystem. Wildlife Monographs, 161(1).

Schwartz, C. C., Haroldson, M. A., & White, G. C. (2010). Hazards affecting grizzly bear survival in the Greater Yellowstone Ecosystem. Journal of Wildlife Management, 74(4), 654-667.

Schwartz, C. C., Harris, R. B., & Haroldson, M. A. (2006). Impacts of spatial and environmental heterogeneity on grizzly bear demographics in the Greater Yellowstone Ecosystem: A source-sink dynamic with management consequences. Wildlife monographs, (161), 57-68.

Servheen, C., Haroldson, M., Schwartz, C., Bruscino, M., Cain, S., Frey, K., Losinski, G., Barber, K., Cherry, M., Gunther, K., Aber, B., & Claar, J. (2009). Yellowstone grizzly bear mortality and conflict reduction report. Interagency Grizzly Bear Study Team, Bozeman, Montana.

Skeele, T. (1994). Madison Grizzly Bear Management Unit, Gallatin National Forest, Montana. The Roads Scholar Project, Predator Project, Bozeman, Montana.

Stedman, R., Diefenbach, D. R., Swope, C. B., Finley, J. C., Luloff, A. E., Zinn, H. C., ... & Wang, G. A. (2004). Integrating wildlife and human-dimensions research methods to study hunters. Journal of Wildlife Management, 68(4), 762-773.

Skuban, M., Find'o, S., & Kajba, M. (2018). Bears napping nearby: daybed selection by brown bears (Ursus arctos) in a human-dominated landscape. Canadian Journal of Zoology, 96(1), 1-11.

Souliere, C. M., Coogan, S. C., Stenhouse, G. B., & Nielsen, S. E. (2020). Harvested forests as a surrogate to wildfires in relation to grizzly bear food-supply in west-central Alberta. Forest Ecology & Management, 456, 117685.

Suring, L. H., Farley, S. D., Hilderbrand, G. V., Goldstein, M. I., Howlin, S., & Erickson, W. P. (2006). Patterns of landscape use by female brown bears on the Kenai Peninsula, Alaska. Journal of Wildlife Management, 70(6), 1580-1587.

Traill, L. W., Bradshaw, C. J., & Brook, B. W. (2007). Minimum viable population size: a meta-analysis of 30 years of published estimates. Biological Conservation, 139(1-2), 159-166.

U.S. Census Bureau, County Population Totals: 2010-2022. https://www.census.gov/data/tables/time-series/demo/popest/2010s-counties-total.html

U.S. Fish & Wildlife Service (1993). Grizzly Bear Recovery Plan. U.S. Fish & Wildlife Service, Missoula, Montana.

U.S. Fish & Wildlife Service (1994). Biological opinion on the grizzly bear management strategy for the portion of the Plateau Bear Management Unit on the Targhee National Forest. US Fish & Wildlife Service, Division of Ecological Services, Idaho State Office, Boise, Idaho.

U.S. Fish & Wildlife Service (1995). Amendment to 1986 biological opinion on the Gallatin National Forest Plan: Incidental Take Permit. US Fish & Wildlife Service, Ecological Services, Helena, Montana.

U.S. Fish & Wildlife Service (2007). Supplement: Habitat-based Recovery Criteria for the Yellowstone Ecosystem. U.S. Fish & Wildlife Service, Missoula, Montana.

U.S. Fish & Wildlife Service (2021). Grizzly bears in the lower-48 states (Ursus arctos horribilis). 5-year status review: summary and evaluation. U.S. Fish & Wildlife Service, Denver, Colorado.

U.S. Forest Service (1985). Cumulative effects analysis process for the Yellowstone Ecosystem. US Forest Service, Bozeman, Montana.

U.S. Forest Service (2006). Forest plan amendment for grizzly bear habitat conservation for the Greater Yellowstone area National Forests: Final Environmental Impact Statement. U.S. Department of Agriculture, Forest Service.

U.S. Forest Service (2023a). South Plateau Landscape Area Treatment Project: Final Environmental Assessment. U.S. Forest Service, Region 1, Custer-Gallatin National Forest, R1-23-15.

U.S. Forest Service (2023b). Comment consideration and response: South Plateau Landscape Area Treatment Project. U.S. Forest Service, Region 1, Custer-Gallatin National Forest, R1-23-15c.

U.S. Forest Service (2023c). Draft decision notice and Finding of No Significant Impact: South Plateau Landscape Area Treatment Project. U.S. Forest Service, Region 1, Custer-Gallatin National Forest, R1-23-15a.

U.S. Forest Service (2023d). Literature consideration and response: South Plateau Landscape Area Treatment Project. U.S. Forest Service, Region 1, Custer-Gallatin National Forest, R1-23-15d.

U.S. Geological Survey, Interagency Grizzly Bear Study Team, Data and Tools. https://www.usgs.gov/science/interagency-grizzly-bear-study-team?qt-science_center_objects=4#qt-science_center_objects

Van Manen, F. T., Ebinger, M. R., Costello, C. M., Bjornlie, D. D., Clapp, J. G., Thompson, D. J., ... & Tyers, D. B. (2023). Enhancements to population monitoring of Yellowstone grizzly bears. Ursus, 33(17), 1-19.

Van Manen, F. T., Haroldson, M. A., & West, K., eds. (2012). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2011. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., & West, K., eds. (2013). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2012. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., West, K., & Soileau, S. C., eds. (2014). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2013. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., & Soileau, S. C., eds. (2015). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2014. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., & Karabensh, B. E., eds. (2016). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2015. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., Bjornlie, D. D., Ebinger, M. R., Thompson, D. J., Costello, C. M., & White, G. C. (2016). Density dependence, whitebark pine, and vital rates of grizzly bears. Journal of Wildlife Management, 80(2), 300-313.

Van Manen, F. T., Haroldson, M. A., & Karabensh, B. E., eds. (2017). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2016. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., & Karabensh, B. E., eds. (2018). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2017. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., & Karabensh, B. E., eds. (2019). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2018. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., & Karabensh, B. E., eds. (2020). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2019. U.S. Geological Survey, Bozeman, Montana.

Van Manen, F. T., Haroldson, M. A., & Karabensh, B. E., eds. (2021). Yellowstone grizzly bear investigations: Annual Report of the Interagency Grizzly Bear Study Team: 2020. U.S. Geological Survey, Bozeman, Montana.

Walker, R., & Craighead, L. (1997). Analyzing wildlife movement corridors in Montana using GIS. In Proceedings of the 1997 ESRI User Conference, San Diego, California. https://proceedings.esri.com/library/userconf/proc97/home.htm

Waller, J. S., & Servheen, C. (2005). Effects of transportation infrastructure on grizzly bears in northwestern Montana. Journal of Wildlife Management, 69(3), 985-1000.

Weaver, J., Escano, R., Mattson, D., Puchlerz, T., & Despain, D. (1986). A cumulative effects model for grizzly bear management in the Yellowstone Ecosystem. Pages 234-246 in Contreras, G. P., & Evans, K. E. (eds). Proceedings—Grizzly Bear Habitat Symposium. U.S. Forest Service, Intermountain Research Station, General Technical Report INT-207.
https://www.researchgate.net/publication/344058766_A_Cumulative_Effects_Model_for_Grizzly_Bear_Management_in_the_Yellowstone_Ecosystem

Welch, C. A., Keay, J., Kendall, K. C., & Robbins, C. T. (1997). Constraints on frugivory by bears. Ecology, 78(4), 1105-1119.

Wells, S. L., McNew, L. B., Tyers, D. B., Van Manen, F. T., & Thompson, D. J. (2019). Grizzly bear depredation on grazing allotments in the Yellowstone Ecosystem. The Journal of Wildlife Management, 83(3), 556-566.

Wielgus, R. B., Vernier, P. R., & Schivatcheva, T. (2002). Grizzly bear use of open, closed, and restricted forestry roads. Canadian Journal of Forest Research, 32(9), 1597-1606.